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THE CONCEALED BEVEL FOR HEAVY MINUS OR PRISMATIC LENSES.

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Very few if any people like the appearance of glasses, and this is even more true of the Myope, as much as they enjoy the outer world brought to them by their high-power concaves. This is not intended for an emcomium or panegyric upon lenses, nor upon our unselfish devotion, but to speak of a slight improvement which can readily be made in the appearance of "thick" lenses, as well as to show how they may be made less of a nuisance to the wearer. Not often do hyperopes complain of the feature of thickness, because their edges are far less conspicuous than those made up with a prism content, or the high concave, where the edges cannot fail to both attract the attention of other people but are considerably in the way of the wearer himself. If there is any possible way of getting rid of both the nuisance and the derogatory appearance in any measure whatever, while also adding to the usefulness of such lenses, we are certainly interested.

It is a custom to bevel all lenses, irrespective of their form, in such a manner that the apex of the bevel comes at the center of thickness. This custom is entirely satisfactory with low and usually with medium powers, but in high powers the custom is contrary to common sense. In the two cuts I have shown the relative position of the eye turned to its lowest position, where at least 90% of our work is done in scholastic and industrial life. In one picture the customary bevel is depicted, and in the other is shown how the apex can be placed well to the outer margin of the lens. In the former case the line of vision is obstructed over a width varying from 5° to at least 10° by the bevel, while in the improved plan the bevel becomes nearly or quite radial to the line-of-vision of the wearer up to the pinnacle which is concealed within the frame rim. From an economic standpoint this space is exceedingly valuable, as it turns into the visual field an area which is usually blank.

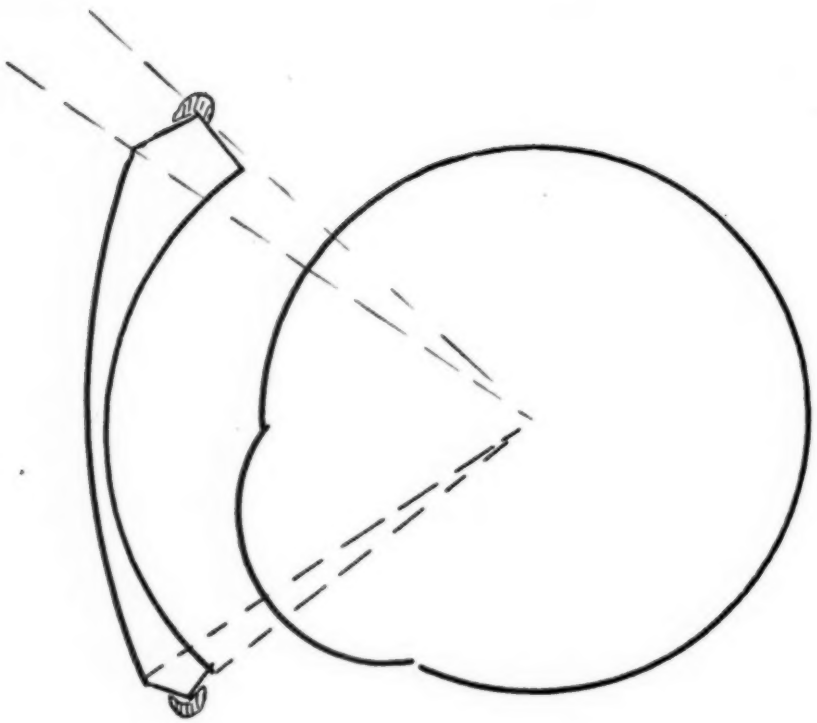

Figure One. Old Form of Exposed Bevel on a Toric Base-up Prismatic Lens.

From the standpoint of appearance, irrespective of the factor of usefulness and convenience, the concealment of a major portion of a thick edge, whether of a concave lens or of a prism, is of tremendous importance. Whether the frame worn is of the heavy Zylo type, or of something much less substantial, the rim itself acts to conceal behind its substance a major portion of the thick edge. When the apex of the bevel is midway, the customary method, this apex only is concealed and often as much as two to four millimeters of

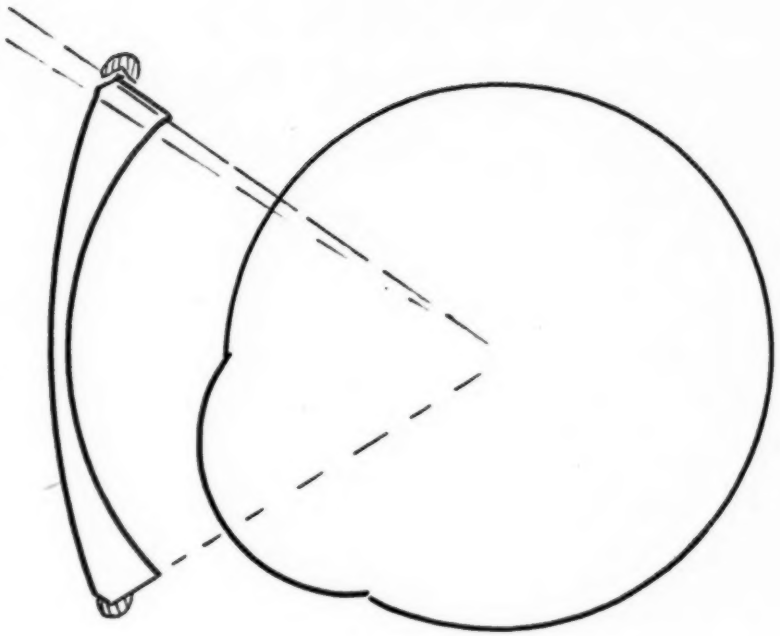

Figure Two. Concealed Bevel for Thick Lenses and Prisms.

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rough edge shows. If this rough edge can be carried backward, placed behind the rim, we have done much toward the esthetic factor; and this is so readily carried out with no disadvantages whatever, that it is a wonder we have not long ago made our lenses in this way.

The brow quite effectively conceals the heavy portion of the top, the bridge of the nose covers the nasal portion, while the temporal portion, extending as it does to the side, quite largely increases the side-field of view, while the lower and by far most valuable field is extended a number of degrees while at the same time materially reducing the blind part.

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OCULAR ELECTROTHERAPY

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CHAPTER II.

ELECTRICAL AND MAGNETIC ENERGY

Energy

All matter has been divided into two groups, the animate and the inanimate. We conceive the animate to be associated with motion, growth and function and the inanimate not to possess any of the attributes just mentioned. Believing that the electron is the foundation of all matter we conclude that the electron—due to its constant motion, is life itself. That the electron is in constant motion has been definitely proven and may therefore be capable of growth and reproduction, hence fulfilling the requirements of life as it is generally accepted. The *electron* with its constant motion, is taken to be the essential cause of *energy*. All matter is inseparable from energy. Likewise *energy* like *matter* cannot be created. Just as it is impossible to reduce a single particle of dust to nothing or create it from nothing so is it also impossible to create or reduce to nothing a single particle of energy.

Transformation of Energy

While energy and matter cannot be created nor reduced to nothing they can, however, be changed from one form to another, they also can be transformed from place to place. For instance, ice can be transformed into water, water into steam; coal can be transformed into gas, or burned into ashes without the loss of a single particle. Energy can also be transferred without any loss, as for instance the energy of waterfalls or of steam can be transformed into mechanical energy, for the operation of machinery. The amount of energy so expanded is equal to the amount obtained in useful work plus the amount expanded in overcoming friction. All energy tends to return to its original form. Heat transforms water into steam, steam in turn produces power, while power in turn passes back into heat, and during all these transfers, not a single electron is lost. This transformation of energy without any decrease or increase in its original amount of energy is called the *conservation of energy*. *The transformation*

and conservation of energy is one of the underlying principles of electrotherapy.

The Natural Electric Distribution

When we ordinarily think or speak of electrified bodies the meaning is understood in the same sense as when we speak of heated bodies. What are heated bodies? They are bodies whose temperature has been raised higher than that which we are usually accustomed to find in them. Just as all bodies possess varying natural quantities of heat under varying conditions, so also do all bodies possess certain natural quantities of electricity in different degrees under varied conditions. Atkinson[9] claims that we have an atmosphere of high or of low electrical potential, just as we have a high or low heat potential—that is a hot or cold atmosphere. We also find that both in the earth and in atmosphere there are present, natural electric currents and areas of high and low electrical potential just as we find similar natural cold and warm areas.

We do not as a rule perceive the presence of electricity in all bodies which surround us as long as there prevails an electrical equilibrium in those bodies, just as under similar conditions, the force of gravity is not perceived, but it is only when the equilibrium is disturbed either by natural or artificial means that we become conscious of the presence of electricity in the same manner as we become conscious of the force of gravity in the falling of an object when a difference of gravity potential has been produced. Bennett[10] maintains "that when electrification is in perfect equilibrium we can not notice any phenomena but when the equilibrium is disturbed the fixed law of physics becomes manifest which says that 'for every action there is an opposite and equal reaction.'"

It is an established fact that the health and vigor, the physical and mental state of the human family is mostly dependent upon electrical conditions both internal and external.

The Mechanism of the Human Body

Grover[11] claims that "from an electro-physical standpoint the human body is the most delicate, intricate and wonderful apparatus of which we have conception. Within its structure are contained electric generators, converters, vibrators, rheostats, condensers, resonators, inductances, transformers, conductors, insulators, collecting and dispersing electrodes. It develops electro-motor-force producing volts, amperes and watts. The skin presents a resistance of thousands of ohms. The body is full of primary cells connected in series and in multiples and develops continuous alternating, sinusoidal, static, inductive and oscillatory currents. Its diathermic apparatus converts mechanical energy into heat. The body as a whole exhibits a polarity which is usually positive but may be changed to negative by surrounding objects, etc. It receives electrical charges and disperses them. It has electric circuits open and

closed. It not only possesses every device known to electrical science, but many details of construction and activity which we do not understand."

When we consider all of the electrical appliances contained within the human body we can readily conclude that there is body current present. This fact has been established through the research work of the leading physiologists. These currents are direct and continue to some degree only. The rate of flow of this current from its point of origin to its destination is only 120 feet per second. The reduction of the rate of flow is due to the many condensers or rheostats existing in the body. The current will flow through any tissue, but will flow best through the nerves due to the fact they are the best conductors the body possesses.

Pathologic conditions cause normal tissues to become an insulator to body current. Tissues deprived of this current will soon begin to degenerate because this body current is the main factor in nutrition. It would therefore be of extreme importance *if we could learn in time when and where obstruction to the body current sets in, and the deficiency supplied from some artificial source, the organ would thus be saved from developing pathologic changes.* When we stimulate a tissue from any source, whether it be light, heat or electricity, the body current is increased. We cannot stimulate any part of the body without inducing currents in these stimulated parts. The induced currents have favorable physiological and pathological effects.

The electrical phenomena plays a very important part in all living organism. Baines and Roberts after conducting a series of researches in electro-physiology which lasted for a number of years reached the conclusion that the electrical phenomena dominates the entire process of reproduction: "During the stage of functional activity, and before reproductive demands bring this to a halt, we find that the nucleus is still the center of life of the cytoplasm, and that any portion of that cytoplasm which becomes separated from the body of the cell, dies, even though it be surrounded by a richly chemical medium from which the remaining protoplasm of the cell body continues to derive its life. The hyaloplasm apparently, therefore, performs two distinct functions. It forms a compound barrier through which pass into the cell only those elements from the lymph which are essential to its working life and specific to its functional activities. But by virtue of its lipoid elements it maintains a constant equilibrium between the electrical potential within the cell and that of the neighboring cells and of the lymph, highly charged as it is with electrolytes, by which it is environed. So long as massive toxic influences are not brought within its area this electrical equilibrium is maintained, but this protection from toxic agents can be overcome; the hyaloplasm fails in this function of barrier, and electrical and chemical diffusion result and the cell is doomed."

Baines carried on researches on electro-physiology for a number of years and finally reached these conclusions:

1. Everything living, whether animal or vegetable, has a well-defined electrical system.

2. Broadly speaking, the edible part of a fruit or vegetable is the positive element, or that part which yields a positive galvanometric reaction.

3. Dry earth is a bad conductor of electricity, and therefore water is required as an electrolyte as well as being necessary in the formation of protoplasm, etc.

4. Every tree, shrub, plant, fruit, vegetable, tuber and seed is an electrical cell, differing from cells made by human agency in that it cannot be polarized or discharged so long as it remains structurally perfect.

5. The skin, peel, rind or jacket of fruits and vegetables is of the nature of an insulating substance primarily designed for the conservation of their electrical energy.

6. The electro-motive force of them all is the same, the current varying in accordance with Ohm's law.

7. Plants grown in pots or removed from the earth and placed in other receptacles differ materially in their electrical constitution from those grown in the earth.

8. If a suitable electrolyte, other than water, is mixed with the soil it is possible to grow plants with much less moisture.

9. Growth may be stimulated by means of a continuous current of electricity of low potential and proper sign.

From the findings of Baines, Steinmetz, Luckiesh, Atkinson, Roberts and others, we may conclude that this force of electric energy is a very important factor in animal economy. Our physical and mental states are to great extent dependent on electric conditions, internal, as well as external. We gradually begin to appreciate its therapeutic values. This science is still in its early stages of development, at the same time one cannot help but be conscious of the fact that it possesses enormous possibilities. Its value as a therapeutic agent will be greatly increased as its physiological relations become more understood.

MAGNETIC ENERGY

Magnetism was known to the ancients several hundred years B. C. just as was electricity. In Magnesia, a country of Asia Minor, magnetism was first discovered in a certain black stone, which they named "magnet stone." This stone has the property of attracting iron and will also point to the earth's poles, when it is so balanced as to have free motion. This last named property is called *Polarity*. This stone has been named *Lodestone*, meaning a leading stone.

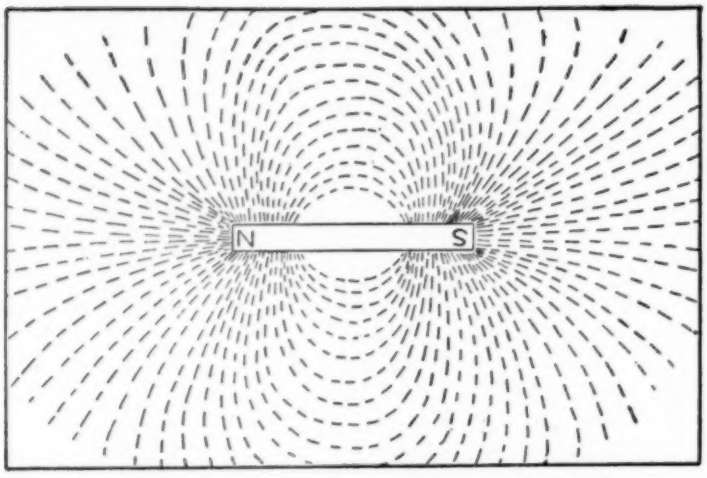

Figure One. (Atkinson) How Iron Filings Arrange Themselves About a Magnet in Conformity with the Lines of Magnetic Force.

Iron or steel can be given both of these properties if rubbed with this stone. Steel will retain them permanently while iron will soon lose them.

Magnetism[12] is one of the many forms in which energy manifests itself through matter as its medium, and like electricity, it is believed to be a mode of molecular motion, propagated by vibrations of the molecules and undulations of the ether. Certain substances possess magnetic conductivity and resistance the same as the conductivity and resistance of electricity. There also exists magnetic induction, mag-

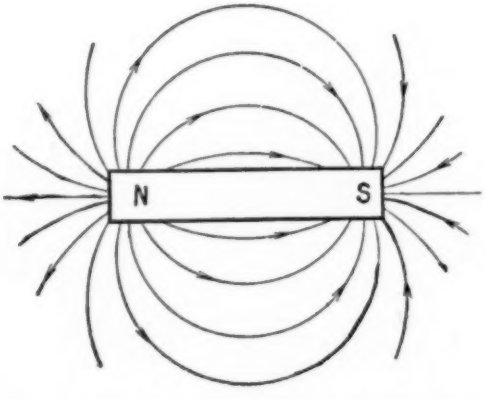

Figure Two. (Atkinson) Field of the Bar-Magnet.

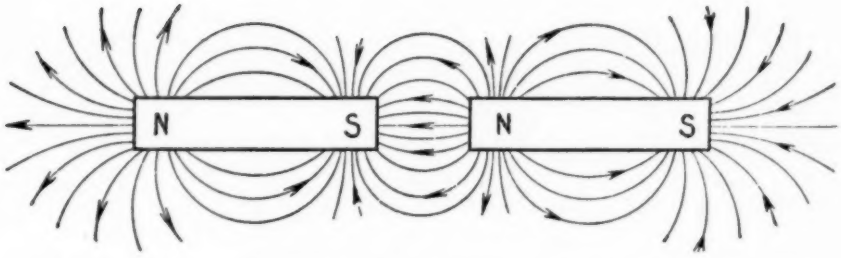

Figure Three. (Spinney) Field Surrounding Two Bar-Magnets.

netic potential and difference of potential—magnetic influences emanate from magnetized bodies as electric influences emanate from electrified bodies.

A magnet possesses certain lines of force. These can best be visualized by placing a sheet of stiff paper over a steel magnet and dust some iron fillings over the paper. Tapping it gently the iron fillings will be found to arrange themselves along the position of the magnetic lines of force as shown in *Figure 1.* They illustrate that the medium surrounding the magnet is in a state of stress. The space so influenced is known as the *magnetic field.*

The lines of force in a magnetic field are best illustrated by drawing imaginary lines through the field in such manner as to indicate in what direction a small magnet pole would tend to move if placed at that point. *Figure 2* illustrates the general character of a magnetic field. *Figure 3* illustrates the character of a magnetic field about two bars of magnet, placed with the north pole of one, pointing to south pole of the other.

The Theory of Magnetism

It has been found that when a piece of hard steel or a blade of a safety razor is magnetized and then broken up into small pieces, each small piece possesses the properties of a complete magnet itself. Each piece has a north and south pole. In a similar manner iron fillings in a test tube can also be magnetized like an iron bar. It is contended that the smallest parts, presumably the molecules of a magnetic substance, are permanent magnets and that the arrangements of these elementary magnets accounts for the difference between magnetized and unmagnetized bodies. In the unmagnetized bodies the elementary magnets are turned in all possible directions and those neutralize each other by clinging together in small groups. Some of these groups are broken up and the elementary magnets are turned in all possible directions when a body is partially magnetized. When it is completely magnetized all elementary magnets are turned to face in the same direction. When an iron bar is magnetized there exists at each

end of the bar a group of unneutralized elementary poles. These groups constitute the poles of the magnet. The elementary poles neutralize each other through the length of the bar as to their effects outside of the bar (with the exception of both ends) where they are not neutralized. *This explains the poles of the magnet and why iron filling will cling to the ends and not to the middle of a bar magnet.*

It is assumed[13] from the electron theory that the magnetism of the molecules is due to the revolving of the electrons about the positive part of the atom in the same way that the earth revolves about the sun. These revolving *electrons* constitute electric currents and the *molecule* is magnetized in much the same way as if a wire were wound about a bar of magnetic substance and a current sent through the wire.

The magnetic lines emanate from each end and curve towards the opposite end, that is they emanate from one end which has positive magnetic potential and curve to the other which has negative, because of the difference of potential between the ends, the return circuit is considered to be through the magnet in the opposite direction.

There are three kinds of magnets: (1) natural, (2) permanent, (3) electro magnet. Natural magnet is one which emanates from lodestone. Permanent magnet consists of hard steel usually in the form of a horseshoe. Both ends of this magnet possess the strongest magnetism and it becomes less until the center is reached, where the amount of magnetism is reduced to zero. A permanent magnet can be made from hardened steel bars (a) by direct touch with another permanent magnet, (b) by placing it in contact with the poles of a powerful electro magnet, (c) by winding a coil of insulated copper wire around the steel bar, then passing a strong current through the coil.

An electro-magnet is constructed of a soft iron bar with a wire coil wound around it. The iron bar is magnetized almost instantly when the current flow begins and loses its magnetism when the current flow ceases. An electro-magnet then is a mechanical device which is so constructed as to be only temporarily magnetized.

Upon comparison it is found that the strength of electro-magnets is much greater than that of a steel magnet of equal size. The reason for the superiority of the electro-magnet over the other type is that the iron core which possesses a high magnetic conductivity absorbs the magnetic lines of force, and permits their free circulation.

Induction

Electric transmission which occurs between an electrified body and other bodies close by from which it is insulated is known as *electric induction.* This body may be a conductor through which the electric current flows or it may be electrified some other way, as by friction, or as by the rubbing of a rod of hard rubber or a stick of sealing wax. Electric induction can take place only when the body is insulated. In 1754 John Canton discovered the fact of induction. He

noticed that an insulated body under the influence of a neighboring charge acquired two charges, the one nearest the influencing charge being of the opposite kind, and the one farthest away being of the same kind as the inducing charge and that they disappear upon the removal of the latter.

Electricity and Magnetism

There are several points of resemblance between electricity and magnetism: (1) the laws of attraction and repulsion operate in both cases; (2) either one may me produced by induction; (3) there are electrical fields of force and magnetic fields of force; (4) there are two kinds of electricity, positive and negative, and there are positive and negative magnetic poles.

There are also several points of difference between magnetism and electricity. The outstanding differences are: (1) electricity may be transmitted along a conductor, magnetism cannot be so transmitted; (2) only a few materials can be magnetized while nearly all substances can be electrified.

Magnetism generates electricity just as electricity generates magnetism. If a steel bar magnet be suddenly thrust into the anterior of a wire coil, a current of electricity known as transient, will be generated in the coil. A similar current but flowing in the opposite direction, will generate when the magnet is withdrawn. A rapid succession of these transient currents would flow if the magnet was given a constant motion in and out in rapid succession.

In 1819 the Danish physicist Hans Christian Oersted[15] discovered the connection between electricity and magnetism. By his experiments he showed that a current flowing through a conductor sets up a magnetic field around the conductor. A magnetic needle brought into the field is deflected. Oersted's experiments paved the way for the discovery of the electro-magnet and the galvanometer.

The direction of the flow of these currents would depend upon the direction of the magnet's pole. When the North Pole area is entered first it produces a current exactly opposite to the one which would be produced if the South Pole area had been entered first. If a straight bar electro-magnet be placed within the coil, which is insulated from it, an electric current transmitted through the magnet's coil will induce a transient current in the opposite direction in the outer coil, and when the current in the magnet's coil is interrupted, another transient current will be induced in the outer coil, which will flow in the opposite direction to that of the first transient current, that is, in the same direction as the current in the magnet's coil. By opening and closing the circuit of the magnet's coil in rapid successions a series of these transient currents flowing alternately in opposite directions, can be induced in the outer coil.

When we connect the terminals of the coil by a wire through which a portion of the current is diverted, we alternately weaken and

strengthen the current in the magnet's coil. When we open and close this short circuit alternately we get a full current at one instant, and a partial current at the next which traverses the coil alternately thus inducing an alternating current in the outer coil proportionately weaker than that produced by opening and closing the main circuit. Coils constructed on these principles are called *induction coils.* These coils are used to a very great extent in electrotherapy.

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[Classification of Physical Agents will be discussed in the next chapter.]— EDITOR, AMERICAN JOURNAL OF OPTOMETRY.

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THE HEREDITABILITY OF HIGH REFRACTIVE ERRORS.

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The data as presented by Dr. Laurence P. Folsom, in the November issue of the American Journal of Optometry, Vol. 5, No. 11, showing hereditary astigmatism in a family case history, is indeed very interesting and there is no doubt in my mind that the average practitioner in refractive work could show many similar cases, proving the predisposition or hereditary tendency of high refractive errors.

There is one family in particular, on my records, that illustrates conclusively, the hereditability of absolute hyperopia with astigmatism and there are other cases on record, where myopia is manifested throughout an entire family.

In the family case record referred to above and presented herewith, the writer calls particular attention to case number two, showing the results of an examination under a cycloplegic.

Case No. 1.

Father, age 56.

Visual acuity uncorrected, O. D. 10/300, O. S. 10/300.
O. D. + 5.50 D. Sph. ⊃ + 2.00 D. Cyl. axis 105 = 20/25.
O. S. + 5.50 D. Sph. ⊃ + 1.00 D. Cyl. axis 75 = 20/25.

Case No. 2.

Daughter age 18.

Visual acuity uncorrected, O. D. 20/300, O. S. 20/100.
O. D. + 4.00 D. Sph. ⊃ + 3.00 D. Cyl. axis 90 = 20/30.
O. S. + 3.50 D. Sph. ⊃ + 3.00 D. Cyl. axis 90 = 20/25.

Note—This patient is wearing this correction with much satisfaction but up to five months ago, was experiencing a great deal of discomfort in trying to use the following correction, prescribed by a well known Philadelphia Ophthalmologist, under a cycloplegic.

O. D. + 3.25 D. Sph. ⊃ + 1.75 D. Cyl. axis 90 = 20/50.
O. S. + 2.75 D. Sph. ⊃ + 2.00 D. Cyl. axis 90 = 20/40.

Case No. 3.

Daughter age 16.

Visual acuity uncorrected, O. D. 20/50, O. S. 20/200.
O. D. + 2.25 D. Sph. ⊃ + 0.75 D. Cyl. axis 90 = 20/25.
O. S. + 3.00 D. Sph. ⊃ + 1.00 D. Cyl. axis 105 = 20/30.

Case No. 4.

Daughter age 15.

Visual acuity uncorrected, O. D. 20/30, O. S. 20/300.
O. D. + 1.25 D. Sph. ⊃ + 1.25 D. Cyl. axis 90 = 20/20.
O. S. + 2.00 D. Sph. ⊃ + 3.00 D. Cyl. axis 75 = 20/80.

Case No. 5.

Daughter age 12.

Visual acuity uncorrected, O. D. 20/40, O. S. 20/300.
O. D. + 3.50 D. Sph. ⊃ + 1.00 D. Cyl. axis 105 = 20/20.
O. S. + 4.00 D. Sph. = 20/30.

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THE EVOLUTION OF GLASS AND THE HISTORY OF SPECTACLES.[1]

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Pliny, the historian, who was born A. D. 23 and died A. D. 79, credits the discovery of glass to the Phoenicians who rested their cooking pots on blocks of natron (subcarbonate of soda), and found glass produced by the union, under heat, of the alkali and sand of the shore.

The earliest examples of glass existing of which the dates are attested by inscriptions are of Egyptian origin. There is an example of this in the British Museum, a small lion's head of opaque blue glass of very fine color, found at Thebes by Signor Drovetti. On the underside are hieroglyphics containing the name of Nuantef IV, whose date according to Lepsius' chronology was 2423-2380 B. C., 4,300 years ago.

Among the most interesting records of ancient times are the discoveries in glass which have given accurate information on the method of manufacture then in use. The most notable discovery is that made by the British Museum, in which tablets from the Library of the Temple of Nabu were found to give detailed instructions on how to melt glass. Only recently has the cuneiform writing of these tablets been translated. They are from Assyria, of the seventh century, B. C., and to the glass man the instructions are remarkably thorough.

The Assyrians manufactured several kinds of glass; one glass was composed of sixty parts sand, one hundred eighty parts alkali, or salicornia, five parts saltpetre and two parts chalk. According to modern ideas, this glass had considerably too much alkali, but undoubtedly, the alkali in those days was not the 100% pure product used now.

A few extracts from the translation of these tablets indicate how they made various types of glass. The original is far more interesting than an explanation of it. The following was translated by R. Campbell Thompson of the British Museum:

"A.—The Preparation of the Furnace."

"(L. I.) When thou settest out the ground plan of a furnace

[1]Delivered before the New York and Pennsylvania Academy of Optometry at Erie, Pennsylvania, on November 22, 1928, also, before the Southwestern N. Y. Optometric Society at Salamanca, N. Y., on November 19, 1928.

for minerals, thou shalt set out the ground plan of the furnace. While they are making the furnace, thou shalt watch them and work thyself, in the house of the furnace; thou shalt bring in embroys (born before their time) * * *."

Another—"A stranger shall not enter, nor shall one that is unclean tread before them; the day when thou puttest down the 'mineral' into the furnace thou shalt make a sacrifice before the embroys, thou shalt set a censer of pine incense, thou shalt pour kurunna-bbr. before them, * * *."

"The wood which thou shalt burn underneath the furnace shall be styrax, thick, decorticated billets which have not lain exposed in bundles, but have been kept in leather coverings cut in the month Ab which corresponds to our August. This wood shall go underneath the furnace."

"B. The Making of the Frit."

"(L. 13). If clear (ibbu) blue glass is for thee to make, thou shalt crush separately:

"10 mana of sand (equal to about ten pounds); 15 mana of alkali ash (equal to about fifteen pounds); 1⅔ mana of styrax gum (equal to about ¼ pound).

"Thou shalt mix them together and put them down in the furnace whereof the floor of the apertures is cold and settle them evenly between the apertures. Thou shalt keep a good, smokeless fire burning until the 'metal' is at white heat! then, thou shalt take it down into the furnace which has been let grow cold; then thou shalt keep a good smokeless fire burning until it liquefies: then, thou shalt pour it on burnt brick."

In this tablet, mention is made of the use of gold, antimony and tin oxide for red glass. These are still used, though lately in America we have added selenium and uranium to the list. They also mention the use of ferric oxide, arsenic, chalk, saltpetre, alkali, (salicornia), copper, manganese, sulphides, mercury and sand.

In other words, in that ancient day, they were using nearly as many ingredients as we are today. Also, the raw materials were probably impure. That is why they found it necessary to use so much soda ash. Modern batches today would call for 1,000 mana of sand and only about 400 mana of soda ash and 200 mana of limestone. Probably, the ash introduced considerable sand of its own accord. It must have introduced a little lime also, as they did not use very much.

On the whole, however, the formulas which they used then were remarkably similar to the formulas we use now. What we have learned about glass-making has been limited to refinements in the raw materials, sources of heat and speed. They used pot furnaces, which are still used in Europe and parts of the United States. The bulk of the glass now is made in large furnaces.

Using wood for fuel and taking so much time off for religious ceremonies apparently did not get the glass hot enough to give a good glass in one melt, so they were in the habit of taking out the first melt, which probably was full of bubbles and blisters, grinding it up and remelting it to refine it. Even then, from the samples we now have, they did not do a good job.

An even earlier period of glass, however, was made during the eighteenth century Egyptian dynasty. At this time Egypt was at its height and Amanhotep the Fourth, or Akhnaton, founded the "City of Horizon of Aton." There was developed in this town some of the finest examples of Egyptian art. The city being built on sand (along the banks of the Nile) could not be expected to last, and Luxor was later built a few miles below it. It is at Luxor that Pharaoh Tut-ankh Amen lived. This was about 1350 B. C.

Recent excavations have shown the position of several glass houses, also a number of vases and other objects which they had made. They even found broken glass pots and saggers with partly melted batch, which tell us some of the story of how they made their glass.

The pots were not the works of art that are produced now, but little shallow cylinders. They also found some of the batch and the silica seems to have been finely crushed quartz instead of sand. Their clay pots were rather thickly lined with a specially purified refractory material, an idea that has been revived recently in the struggle for better glass pots today. Evidence from the composition of the materials, and the fact that some of the samples are fairly well melted, indicate that they had to have at least 1,500 to 1,800 degrees Fahrenheit. (We use 2,500 to 2,700 degrees Fahrenheit today.) However, as most of their wares were for decorative purposes, they made a good deal of colored glass and opaque glass, so that the imperfections did not show up. Very little has been ascertained as to the practice of the art during the dark ages, when civilization was destroyed but it would seem to have been preserved in France and Germany and perhaps in England, and possibly Spain.

The fact narrated by Bede in his history of the Abbotts of Wearmouth, that Benedict Biscop about 675 procured workmen from France to make glass for his monastery, thus shows that it was preserved in France and lost or nearly so, in England.

The earliest known lens is a plano convex, 1½ inches in diameter, with a 4 inch focus, found in the ruins of Old Ninevah by Sir Henry Layard. The lens is rock crystal, not exactly round, 1.6×1.4 inches in diameter, 0.2 inches thick. It is a question whether this rock crystal came from China or is Brazilian rock crystal. In the nineteenth century, the most costly lenses were made of Brazilian crystal, which was most extraordinarily clear. The earlier lenses were ground out of smoky colored stone, berillus, from which the German name "Parillen," later "Brillen," is derived.

During the fourteenth and fifteenth centuries, only convex glasses were known; concave ones came into use early in the sixteenth century. It is said that Pope Leo X (1475-1521) was very near-sighted. "With them," he said, "I see better than my companions." And, an oil painting of him by Raphael 1517, in the Pitti Palace at Florence, shows the Pope holding a single round glass in his left hand. The concavity is plainly shown by the reflex.

Molyneux, the historian, gives as his opinion that Roger Bacon "did perfectly well understand all kinds of optical glass and knew likewise the manner of combining them so as to compose such instrument as the telescope." Bacon, himself, says that glasses may be so formed that the most remote objects may appear just at hand and the contrary, so that we may read the smallest letters. Marvelous are the conclusions that may be formed by glasses concave and convex. In 1276, he said that glass lenses were very useful to those whose sight had become impaired. This is the first mention of spectacle lenses.

These passages certainly prove that Roger Bacon, who lived between 1214 and 1294, understood the art and science of lenses.

Optical glass is of two principal kinds, flint and crown. The first really successful maker of optical flint glass was M. Guinand of Solothurn in Switzerland in 1814. He succeeded in making optical glass free from straie by breaking and reuniting the portions by heat when the glass was in a plastic state. Guinand died in 1823 and it was from his son that M. George Bontemps learned his secret, viz:

"Optical flint glass contains more lead and is consequently heavier and more refractive than the quality used for common purposes.

"It is made in a pot furnace having a single covered pot, and Guinand's secret consisted in constantly stirring the mass while it is in a molten condition so as to keep the heavier lead silicate from falling to the bottom.

"For the very highest quality of optical glass, the contents of the pot are most scrupulously cleared, and the stirring is continued after the heat is lowered 'till the contents are cooled down to a little more than a red heat—the furnace is then closed and the metal is allowed to cool and anneal gradually in the pot within the furnace.

"When withdrawn, the pot is broken and the mass of glass is polished on two opposite sides so that any imperfections may be detected."

Later at a small town near Paris, Choisy-Le-Roi, he further improved the manufacture. In 1848 M. Bontemps was induced by Messrs. Chance of Birmingham, England, to establish the art in their great works there.

In 1800, the scientist, Thomas Young, after a study of his own eyes, discovered that he had an unequal curvature of the media. He

published his observations in 1801. They created discussion and later on, the astronomer, George Airy, ground cylindrical lenses for the correction of astigmatism and had a pair made for himself by the optician Fuller of Ipswich in 1827. McAllister of Philadelphia, in 1828, and Suscipi of Rome, 1844, also ground cylindrical lenses.

Daca de Valdeo of Seville, 1623, was the first to try to establish rules for numbering the lenses. At the beginning of the eighteenth century the system of designating lenses by the radius of curvature was originated in France.

Periscopic lenses were recommended by Wollaston in 1803, though they were first mentioned by Hertel in 1713. These are some of the facts in the history of glass making.

Spectacles came into use as a natural sequence to the perfecting of glass. In a manuscript published in Italy in 1289 we read:

"I am so weighted with years that without my glasses, called spectacles, I have strength neither to read nor to write. These have been recently invented for the convenience of poor old people whose sight begins to fail."

In 1305, Giordano da Rivalta, a monk of Pisa, wrote:

"It is not yet twenty years since the invention of spectacles, which secure better sight, one of the most useful arts in the world. I, myself, have seen and talked with those who first made them."

In the Museum at Vienna, is a statue, the left hand holding to the eyes a pair of glasses. On the statue is the inscription:

"Here lies Salvina d'Armata degli Armati of Florence, the inventor of spectacles. May God forgive his sins."

He died in 1317 A. D.

This remarkable incident occurred early in the fourteenth century:

"Pietro Buonparte, Ambassador at the Austrian Court in 1319, created a great sensation at the marriage of the Grand Duke's sister, by appearing with a pair of spectacles upon his nose, these being a recent invention of Salvina, called Armati."

In the Monastery Archives of St. Katharine in Pisa, history gives the following:

"Brother Alessandro della Spina, a modest and good man, learned to make all industrial products of which he saw or heard. Spectacles, which were made first by someone else, who did not want to communicate anything about them, were then made by him and were distributed with a cheerful and benevolent heart. He died in 1313 A. D."

The first physicians to mention them were Gordon, professor of medicine in Montpelier, 1305, who stated that "thanks to his excellent remedies, glasses were superfluous," and his contemporary, Professor Guido of Avignon, who, after praising his remedies more modestly, remarked that "if they did not help, the need of glasses

was indicated." Meissner says that spectacles were known in Germany about 1260-1280. Nevertheless, as I have stated, historians agree that to Roger Bacon credit must be given for developing lenses for practical uses.

It is interesting to note that some historians question whether the invention of spectacles should be credited to the Mongolian or Caucasian race. It is possible that the Chinese used glasses at a very early period. There exist some old pictures which show Chinese reading with glasses of different patterns. One kind is kept in position by a cord which passes around the ears. The glasses are held away from the face by a stationary bar attached to the middle of mounting and pressing on forehead. In another, the glasses are held by two cords which pass over the ears and hang down to the breasts; they are kept in position by weights attached to the ends. The lenses are round and very large.

The lenses of these spectacles mentioned by early travelers were made out of a slightly yellow-brown stone, called tea-stone, very probably topaz. Let me call your attention to the "Granddaddy of all shell spectacles" the Chinese spectacles I have in my collection. Nearly thirty years ago, a missionary from China brought me this pair. The lenses are 44m/m, round and plano. The rims are real tortoise shell, and the mountings are probably made of some low grade alloy of white metal and are very crude in construction. The straight temples are 5½ inches long and the joint hinge is 2¼ inches from the end which has a round loop ½ inch in diameter—probably to allow passing a cord through to tie around the head. My friend could not definitely place the period when these glasses were used, nor explain why they contained plano lenses, but he remembered being told that the Chinese wore glasses as a mark of wisdom, dignity and authority. I particularly call your attention to a pair of spectacles which antedates all others that I have. The frames are of iron with hinge temples made very much like those of the Chinese pair just spoken of. The lenses are oval, very small and bi-convex 6.00 D. Sph. and of rich emerald green color. Though they are slightly scratched, they have not lost their brilliancy. No doubt, these spectacles are of German origin and date back at least to the early seventeenth century.

In the fourteenth century, the use of glasses spread slowly throughout Europe. They were called a "device of the Devil" by the superstitious. Reference to them in documents, as well as pictures, shows the Coat of Arms of the Spectacle Maker's Guild in France, 1581.

Pictures of the fourteenth, fifteenth and sixteenth centuries show some interesting designs and styles of spectacles:

A mural painting of St. Jerome by Ghirlandja, 1449-1494 in the Church of All Saints at Florence, Italy, shows the Saint holding a pair of spectacles in his hand.

Again, a picture by Dupuis who lived in 1696-1770, shows a "Peddler of Spectacles." "The Spectacle Peddler," an engraving by W. E. Dietrick (1741) shows the peddler carrying a tray of spectacles, and a woman is shown testing the power of a glass on the fabric of her apron.

An engraving, entitled "Spectacle Dealers," by J. Callaert, (1520-1567), at Munich, shows two dealers, whose shops open on the street, selling glasses. At one stall, three persons are wearing glasses; a number of pairs lie on the table. At another stall, a woman has on spectacles, and is holding a book close to her eyes while the dealer, who, of course, wears glasses, is writing in a book. Another woman, seated nearby, also with glasses on, is looking at something held in her right hand. To the right is a boot and shoe shop, where a man, wearing glasses, is working on leather, and, near him, another man, wearing glasses, is repairing boots. Another old picture, called "The Biblomaniac" in Sebastian Brants' Warrenshiff, 1494, shows a woman in a church, wearing glasses as she reads her bible.

An etching by Rembrandt, (1606-1669), shows an old woman asleep over her book; she has spectacles in her hand.

In 1644, gold was discovered in Norway, from which some ducats were coined by order of King Christian IV. On one side, under a pair of glasses are the words, "Vide mira domini"—"Behold the miracles of the Lord."

A Freemason's ducat has below a pair of eye-glasses, the inscription "Das gautze Geheimus" which, translated, reads "The Whole Secret." History does not give the date of this rare coin.

In the Germanic Museum of Nuremberg, there is an historic collection of spectacles and eye glasses, dated the sixteenth century, showing the different styles of frames and materials used. This museum also contains a copy of the By-Laws of the Spectacle Guild of the year 1600. One pair of glasses in the Nuremberg collection particularly attracts attention. The lenses are large and round, and are held in a ring of black horn about half an inch wide; the two sides are united by a leather band nearly an inch long, and are kept in position by another leather band passing around the head.

Another pair, supposed to be of much earlier date, is described by Greef of Berlin, as probably made before the year 1500. These were found in an old fifteenth century folio by Jacques Rosenthal, the antiquarian bookseller, and presented by him to the Nuremberg Museum. The frame is of tanned blackened leather. They are very clumsy and very thick.

Greef also traces the evolution of the true modern spectacles from the old nose riders, (the originals of the pince-nez), and describes the binocles, which came into fashion in 1796 consisting of two lenses mounted on a scissor-shaped handle, the original of the modern lorgnette. The earliest form of the true spectacle glasses

was invented and introduced by Monsieur Thomin and were essentially "temple spectacles," the shanks extending no further than the temples. There were two kinds, one with a small end-plate-let, which was represented in a portrait by Pelham, an English painter, of the eighteenth century, of which a copper plate was made by J. Clark; the other, which is to be seen in Graff's portrait of Chodowiecki, (1795), with a characteristic large circular fastener at the end of the shank, which held the spectacles against the temple. The next stage was that of the "ear spectacles," which, at first, had crude heavy, clumsy, shanks, jointed at the end, like those in the Beethoven house at Bonn, which were further improved by slitting the ends, or by means of an olive-shaped fastener. The next improvement, consisting of a jointed appendage to the shank, was made in 1752 by the London optician, J. Ayscough. A later variant of this joint passed downward and backward underneath the ear. Still, another variety of this joint was so arranged that it could be bent back when glasses were not in use.

Early in the seventeenth century, the price of a pair of spectacles was from forty to seventy-five dollars in Germany. Let me say, that to the ancient Hebrews and Egyptians spectacles were unknown. The early Greek historians do not mention them, so it is assumed the Greeks, too, were unacquainted with them. No mention is made in the entire Latin literature, medical or non-medical, of spectacles, so, the Romans, like other ancient nations, did not know about them. It was not until the thirteenth century that spectacles came into use.

In 1853, J. J. Bausch and Henry Lomb formed a co-partnership at Rochester, N. Y., where they manufactured eye-glass frames, especially the old hard rubber nose-pincers. Mr. J. J. Bausch, in the year 1863, constructed the first power grinding and polishing machine made in this country. The first compound lenses were made by them in 1865. These were the flat type of compound lenses. Toric compound lenses were first made in America in the year of 1885. In 1874, Messrs, Bausch and Lomb erected their first building on their present factory site. In 1890 they formed an alliance with the Carl-Zeiss Optical Works of Jena, Germany, and from this date the optical world knows only too well what this pioneer firm has done for the advancement of Optical Science, not only in this country but throughout the world.

Let me quote to you an excerpt from an early edition of the Encyclopedia Britannica. This we may consider authority for that period:

"Spectacles are flat glasses, employed to detect and correct defects of the eyes, made of crown glass or rock crystal 'pebbles,' the latter being lighter and cooler to wear, mounted with rigid spectacle frame for continuous use;—eye-glasses, where worn intermittently, and hand glass or lorgnette to supplement temporarily the

spectacles worn. No glass could be employed with comfort for any length of time. Young adults, with slighter forms of hypermetropia, need glasses only for near work. Elderly people should have one pair of weak glasses for distance and another stronger pair for near vision. These may be combined as in Franklin lenses, where the upper half contains a weak lens and the lower half, a stronger one."

"It is difficult to lay down rules for the treatment of cases where the refraction of the two eyes is unequal. If only one eye is used, its anomaly should be alone corrected. Where both eyes are used, and nearly of equal strength, correction of each often gives satisfactory results."

Speaking of presbyopia, it says:

"Convex lenses should be used for reading to see clearly about eight inches."

Regarding cylindrical lenses, it says:

"The correction of astigmatism is in many cases a matter of considerable difficulty, but the result to vision is almost always reward of trouble."

This thought has occurred many times to me and very forcibly, I pass it on to you as a prediction:

"Due to the development of the aeroplanes for general and individual use, it is possible that Optical Science will develop a new form of telescopic spectacles to amplify distance vision, within the next decade."

Surely that is not impossible nor improbable.

The careful and scientific refractionist does no guessing and he should realize that the fitting and adjusting of glasses is more important than when Cowper wrote two hundred years ago:

> "Between nose and eyes a strange contest arose;
> The point in dispute was, as all the world knows,
> To which the said spectacles ought to belong."

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[An interesting collection af antique spectacles were shown at the conclusion of the paper.] EDITOR AMERICAN JOURNAL OF OPTOMETRY.

A QUESTIONNAIRE ON THE ASSOCIATED FUNCTIONS OF CONVERGENCE ACCOMMODATION AND FUSION

In the effort to broaden our understanding of the associated functions of convergence and accommodation the following questions were sent to Dr. Joseph I. Pascal and several other men whose outstanding work in ocular myology makes their views on these matters of the utmost importance and we believe of the greatest interest at this time. We will publish in subsequent issues the views on these questions, of other of our practitioners.

The questions are as follows:

What is the relation between esophoria (excessive convergence) at the near point in the young adult and high exophoria (convergence lag) in the presbyope?

Is the one the forerunner of the other? That is, can we expect the young adult with excessive convergence at the near to have convergence lag of high amount at the near when he becomes a presbyope?

If not, why is it, that convergence excess at the near is the common imbalance found in the young while convergence lag is usually associated with the presbyopic period. Why is it, that the percentage of convergence excess cases found among young patients dovetails with the precentage of convergence lag cases found in the older ones? Why is it, that the young patient who shows a convergence excess is as a rule the ardent, energetic, "doer" type and this also holds true of the average presbyope who shows a convergence lag? Are these facts mere coincidence or do they point to the fact that convergence excess at the near in the young adult presages convergence lag in the prebyope?

If it can be demonstrated that the convergence excess of the young adult turns into the convergence lag of the older patient, what is to be done about it?

We know that uncorrected hyperopia, hyperopic astigmia, over corrections of minus, prism power base-out, wide interpupillaries and pathology cause excessive convergence. What other factors are causative?

Does a convergence excess at the near always keep company with a faulty, incomplete, or imperfect fusion sense?

If so, is it this lack of positive binocular fixation or anchorage, associated with faulty fusion, which permits the development of a

convergence lag when the accommodation no longer functions unaided at the near point?

Further, what factors contribute toward the conversion of a convergence excess into a convergence lag? We know that over-corrections of plus, especially reading corrections for presbyopes, and base-in prism power gradually bring about convergence relaxation, which can result in a convergence lag. What other factors produce this result? Do small segment bifocals tend to cause convergence lag by the disturbing effect they may have or near point fixation? Are large segments conducive to easier near point vision when there is a convergence lag present?

If prism power base-in only tends to convert one distressing condition (convergence excess) into another (convergence lag) over a period of years, is it not questionable procedure to use such prism power either for wear or exercise without close and constant supervision of the case? Should not the use of such procedure always be accompanied by fusion training?

Is correction of a faulty fusion sense the surest and sanest way to establish comfortable ocular balance? If so, should not all orthoptic training stress the development of greater fusion power?

These questions are asked with the view of clearing up the haze surrounding the whole question of ocular imbalances. We believe that the group mind of our leading optometrists can solve the problems of ocular balance and set our feet upon the pathway of clarity and established facts.

The answer to the above questionnaire, by Dr. Joseph I. Pascal, will be found on the following page, while the comments on this subject as presented by Dr. Ivan S. Nott will be found on pages 19-29 of Vol. 6, No. 1, of The American Journal of Optometry.

CONVERGENCE, ACCOMMODATION AND FUSION

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In the ten questions and propositions submitted some things are assumed as being facts. The following discussion therefore is based on the asumption that those facts are well founded. Of course any one challenging the facts undermines the premises and more or less invalidates the ensuing discussion.

For instance, proposition No. 3 states that near point esophoria or convergence excess in the youth is found almost as often and in the same type of individual as near point exophoria or convergence lag in the presbyope. Taking this as an established fact, there is little likelihood of such fact being a mere co-incidence. It almost certainly points to either a causal relationship between the two or to both being effects of the same common cause.

A reasonable explanation is that the near-point esphoria in these ardent, energetic youths is due to a high tonicity of the convergence center, which is one of the 'active' centers of the brain. It is an exprssion of the abundant energy and vitality resident in the individual. But as this youth continues in life, usually with unslackened pace, if he carries the ardent, energetic stride way into his presbyopic period, then exhaustion of this center is very likely to follow, with the resultant convergence-lag at the near point. This would be a 'passive' exophoria late in life as a result of an 'active' esophoria early in life.

Incidentally, this is a common phenomenon relative to the body as a whole. In this age of hustle and bustle, exercise and activity, the boys who have a high vitality have thrown into a false perspective the whole subject of exercise and rest. The up-building, recuperative powers of the body are attained during its phases of rest and relaxation. The cause of all ills is congestion, broadly speaking; congestion of the blood in inflammation, of the intestinal tract in constipation, especially the latter with its numerous disease-bearing consequence. Muscular contraction produces tension and consequent congestion. This has to be more closely watched for possible ill-effects than excessive rest, though anything to excess is unwholesome. It is safe to say that for every one who is below par because of too little exercise there are ninety and nine who are wearing themselves out with too much exercise.

Question 4 asks what is to be done about it. Well, to slacken

one's pace as one grows older would be the most natural way of preventing this exhaustion and loss of tonicity of the convergence center. Some weakening of tonicity is to be expected with advance in years, but not to the extent of producing an actual exophoria, beyond the physiologic amount.

To question 5, we would add a weak divergence, either in the nerve center or in the musculature. Landolt, from his extensive experience, strongly protested against tenotomies of the internal recti for correcting esophoria. He claimed that the excess convergence was really due to a weakness of the divergence, rather than to a genuine, excess power of the convergence. Therefore he advocated the logical procedure of giving to the external recti more power by an advancement operation, instead of weakening the internal recti by a tenotomy. Anatomically weak or underdeveloped external recti are not frequent, but they are certainly present occasionally. In fact, all sorts of anomalies are found among the orbital muscles as are found amongst the other muscles of the body. There are occasionally supernumerary muscles in the orbit, very thin and ill-developed muscles, muscles replaced by fibrous bands or tendons, etc. It is true that the vast majority of muscular imbalances have their cause in structure ***behind*** the orbit, but the occasional cause being ***in*** the orbit is undoubted. The questionnaire statement that excessive convergence is caused by wide inter-pupillaries can readily be challenged, as wide inter-pupillaries by making convergence more difficult more often result in exophoria. Narrow inter-pupillaries and peculiar formation of the orbits may be given as other causes.

Neither near-point esophoria nor near-point exophoria, it seems to me, is directly associated with a faulty or weak fusion faculty. On the contrary, the very existence of a phoria, a tendency rather than a tropia, points to a strong fusion faculty. Training of the fusion faculty, which is a mental faculty and therefore more susceptible to training, should be undertaken in all cases where such faculty seems weak. This regardless of any muscular balance or imbalance. A strong fusion faculty will keep the eyes working as a single organ even under difficulties. And such difficulties may develop even when there is muscle balance. Moreover so long as the eyes do function as a single organ, most hindrances can be removed and the eyes be made to work not only as a single organ but as a balanced, comfortably adjusted single organ.

The strength or weakness of the fusion faculty can be ascertained by various tests, the red glass test, the duction tests, the stereoscopic tests, and others. It is good practice to have one or more of these tests made in each case to ascertain whether or not the fusion faculty is weak and needs training. This, regardless of the presence or absence of muscular imbalance, though such training is more important when a muscular imbalance is present.

Question No. 7 implies the possible development of a convergence-

lag in presbyopia 'when the accommodation no longer functions unaided (by lenses) at the near point.' But whatever the relation may be between presbyopia and the development of a convergence-lag it is not correct to say that in presbyopia the accommodation no longer functions unaided.

It is a fact that must be stressed and emphasized over and over again that in presbyopia, while the actual increase in focusing power may be slight, the muscular contraction corresponding to it and the associated nerve impulse may be as strong and even stronger than in youth. One must clearly distinguish between the actual work of the accommodating mechanism, the muscle and nerve functioning involved, and the result of such work as it appears in increased focusing power. Fuchs calls the resultant accommodation the physical accommodation and the muscle-nerve effort involved the physiological accommodation. In general, in presbyopia though the result of the accommodative activity may be slight the actual work may be excessive, and by itself through the associated convergence impulse may induce a convergence excess rather than a convergence-lag.

The use of prisms base-in for esophoria is similar to the use of plus lenses in myopia, or rather apparent myopia. And just as the plus lenses by their action as repression lenses may be beneficial in those cases of myopia that are only functionally so and not structurally myopic, so may the prisms base-in be beneficial for those cases of esophoria that are functional and not structural, the latter being rather rare. It is well established that the vast majority of esphoric cases are functional in origin. This being so, there is no harm in giving the prism base-in treatment until the true condition of exophoria is gradually revealed later on.

Training of the fusion faculty will not restore comfortable ocular balance. But such training should be given whenever the fusion faculty is weak, as was discussed previously. Comfortable ocular balance is obtained by bringing about a physiologically normal adjustment between the intrinsic and extrinsic eye muscles, or strictly speaking between their respective innervations. Such physiologic adjustment or harmony is largely independent of the strength or weakness of the fusion sense.

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THE CORRECTION AND PREVENTION OF GLARE WITH A REVIEW OF SOFT-LITE ABSORPTION GLASSES AND THEIR USE IN CASES OF PHOTOPHOBIA.

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Many a time an individual is convinced on the basis that he may have given a theoretical explanation of a subject without suggesting any remedy thereof. That may have been the case partially in my discussion on the subject of Glare in a previous issue of this Journal[1], but was done intentionally. A suggestion of remedy is generally left to the judgment of the practitioners, for they themselves can find a solution best suited to each problem, for each case varies individually.

When copies of the writer's thesis on "Glare in Visual Evolution" was published, I received requests of suggestions for a remedy, and in this short paper I will give, as far as my limited data permits, a definite reply to these requests.

When investigating the subject of Glare, I have used not only the theoretical principles mentioned in my first article, but also actual cases in my practice, where correcting lenses and absorption lenses were used. In carrying out this experimentation, it has been within my power to satisfy partially, some of the requests asked by various practitioners.

Before going into detail on the subject of correcting glare, the writer would prefer to give a few of his opinions on ophthalmic glass and absorption glasses in general. Lenses are prescribed with the purpose, to as nearly as possible correct a refractive defect, thus giving comfort to the patient. We know from our experience in practice that one may, according to our theoretical laws require a certain correction because of a definite refractive error and yet such lens could not be worn comfortably by the patient. In this I am excluding muscular insufficiencies, (intrinsic and extrinsic) and pathologic conditions (general and ocular). This in many cases is due to hyper-sensitivity of the nerve cells to excessive, or even normal light, as compared with the chemical discharges which change the radiant energy to nervous impulses. For these cases, I therefore be-

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[1][In the December, 1928 issue of the American Journal of Optometry, the reader will find a discussion on the subject of Glare in general, by the same author. Dr. Beacher is instructor in the Theoretic Optics at the Pennsylvania State College of Optometry.]—Editor, American Journal of Optometry.

lieve, that some assistance is required to cut down the intensity of illumination. Naturally, of course, we have several degrees of sensitivity, so we, if possible, must not omit finding relief for such differentiation as it would present. I have therefore, secured data on the absorption of the spectrum in white ophthalmic glass and the different tinted shades of the Soft-Lite absorption glasses.

As is known whenever light passes from one medium to another, its speed is retarded in the medium of greater density. When light passes from air into glass, its speed is therefore retarded. In its effort to pass through the glass some of the light is transformed into heat energy which is then liberated into the air. This factor of changing light energy into heat energy is absorption. It is evident then that a tinted lens tones down the intensity of light. This holds true not only of tinted lenses but also of white lenses but to a lesser degree. We must also realize that there are different degrees of sensitivity of the retina for no two individuals are alike and thus no two pairs of eyes are necessarily equal in their sensitiveness to light stimulus.

In experimenting with Soft Light Ophthalmic Glasses the writer found them very practical wherever photophobia was indicated. This glass has a slightly pinkish appearance, and its index is the same as that of crown glass, that is 1.523, thus permitting the use of the same curves as are used on crown glass. One of the points just mentioned was the fact that just as in any discomfort or deviation from the normal, there may be different degrees. Soft-lite absorption glass meets this requirement insofar as they are compounded in three standard shades, each with a different absorption quality. The light shade absorbing 15% of the visible spectrum, the next shade 25% with the dark shade absorbing about 35% of all light. A graph of this absorption power would show an almost straight line of absorption for the spectral colors, due to the fact that it absorbs all colors of the spectrum equally. If we compare the Soft-Lite "curves" with those of white ophthalmic glass we see that they run parallel, the only difference being that as tinted lenses they naturally absorb various percentages of the visible spectrum, thus, I believe, giving us a form of remedy for photophobia of different degrees.

Using my theories on the subject of Glare, it has been my belief as well as the belief of many other optometrists that in correcting this condition of glare a lens is needed which meets two requirements: (1) Absorption power greater than that of white glass, and (2) transmitting all the ultra-violet rays possible. I find that Soft-Lite absorption glasses meet each of these two requirements. The absorption power of the Soft-Lite (light shade) is 15% thus transmitting 85% of the incident light. This, I believe, is quite sufficient for the individual to receive all the retinal stimulation needed for visual interpretation, plus the comfort derived from resting that factor

which with less absorptive lens would, in certain cases, result in a painful photophobia.

In order to answer directly the questions as to relief of photophobia due to glare, or the prevention thereof, as presented to me by a number of those who read my previous article on the subject of Glare, I shall attempt to show cases which illustrate some of the results. These may help optometric practitioners to further investigate this subject.

Case 1. Patient wore lenses for constant use. Age 32. The correction was O.U + 1.25 D. Sph ⊃ + 0.50 D. Cyl. Axis 90. These lenses were prescribed by an optometrist who could find no solution to continual complaint made by the patient. The history of the case presented symptoms of photophobia, the patient stating that he feels more comfortable in a poorly, or less illuminated room. My findings were identical with those previously prescribed and the only addition I made was to have the formula made up in soft light absorption glass. Absolute satisfaction and comfort resulted.

Case 2. A myope of six diopters complaining of seeing "too sharp" images at a distance. Visual acuity with skiascopic findings, — 6.00 D. Sph. was 20/30. With the — 5.00 D. Sph., the vision was cut down very slightly to a little better than 20/40. Using the history of the case as a guide, a reduction of the minus power was attempted but this produced a surprising reduction of vision. A — 4.00 D. Sph. afforded the patient only 20/100 vision. A — 5.50 D. Sph. gave perfect 20/30 vision and prescribing this in the light shade of Soft-Lite gave comfort to the patient.

Case 3. A patient of 52 years of age had been diagnosed to be in the incipient stages of senile nuclear cataract. Six months later, the opacities were far more developed than at the first examination. After the elapse of three additional months the case was yet far from being matured, but had shown a definite progress over the previous visit. The optometrist to whom this patient came at each of the just mentioned periods, then prescribed Soft-Lite lenses with the experimental attitude more than with an expectation for results. However, in this, and several other cases since, he has found a much decreased intensity in the growth of the lenticular opacities. The chief reason for this experiment was the fact that the patient made a definite statement that she would prefer blindness to an operation.

Case 4. Patient, an individual, who after examination showed no trace of either refractive error nor muscular anomaly, and who claimed to have had recently a physical examination which revealed perfect health. His complaint was one of nervous nature, which it seemed produced a blephero-spasm by the continual attempt to keep the lids closed almost totally. Photophobia was definitely diagnosed. The light from the diagnostic instruments was very painful. Plano lenses of the light shade of Soft-Lite corrected satisfactorily the complaint.

If not for the limited space, the writer could cite case after case of this type, using his own records as well as recalling cases in which he has been called in as a consultant. In cases of aphakia it is evident that a supplementary absorption lens would be advisable for we not only have to supplement the refraction due to the extraction of the lens but also its absorptive property. In myopic cases a number of refractionists, including the writer, have experienced great satisfaction in prescribing absorption glass. This procedure, I believe, is of much advantage to the patient. There is, however, one case where I will not only refrain from advising to prescribe a tinted lens but strongly recommend its avoidance. In cases of amblyopia exanopsia our optometric method of treatment is light stimulation upon the retina. There, we are trying to stimulate retinal activity and hence, we need all the light we can possibly get and thus no absorption lens should be used in cases of this sort.

In conclusion let me again restate my theories regarding photophobia resulting from glare and my beliefs as to the correction of this condition. I believe that glare results, not from an overabundance of ultra-violet but rather from the excessive amount of visible spectrum which in certain cases reaches the retina, and that it is therefore our duty to prescribe in these cases of photophobia lenses which do not absorb the needed ultra-violet any more than can be helped, but rather absorption glasses which reduce only the visible spectrum.

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LENSES SUBJECTED TO THE NEUTRALITING PROCESS FOR USE IN SELECTED CASES OF NUCLEAR CATARACT

Dr. E. LeRoy Ryer and Dr. Elmer E. Hotaling describe the following case of nuclear cataract which was materially benefitted by prescribing deeply tinted lenses with clear lower areas, these appliances to be used constantly. The advantage of this therapy, like that of Scherer[1] and of Koch[2] being that by means of its use, the patient's pupils became proportionately larger because of the large tinted area which excluded all but the most necessary light rays.

"Patient, female age 71, nuclear cataract[3]. Led in by her daughter. Usual routine examination omitted because one glance with ophthalmoscope showed pupillary area of each eye covered by semi-opaque lens. Visual acuity so low that even finger counting was too indefinite to record. Assuming that entire lens of each eye was affected, we dismissed case as beyond aid from lenses. By chance we noticed her carefully adjusting a translucent celluloid eyeshade before putting on her hat. Asked the object of the eyeshade, she replied, that she saw much better if her eyes were shaded from light. We mention this to show how alert one must be to pick up the slightest hint of diagnostic significance. Atropine would have uncovered this but may have precipitated glaucoma. Still confident that at her age there would be no appreciable pupillary light reflex, we started all over again. Dimming the general illumination of the

examination room and employing feeble skiascope illumination, we found the pupil sufficiently enlarged to have uncovered a small crescent-shaped area, slightly cloudy but far from opaque, at the top of the pupillary opening. This opening was large enough to permit skiascopy which indicated:

R.—3.00 Sph.⊃—1.25 Cyl. axis 90.
L.—3.00 Sph.⊃—0.50 Cyl. axis 90.

Ophthalmometer:

R.	49.37 at 180	L.	48.25 at 5
	48.37 at 90		49.50 at 95

"While we always look for disconcerting lenticular changes in cataract cases we were encouraged none the less to find the corneal measurements corroborating the skiascopic findings of the astigmia against the rule. Subjectively we obtained 20 per cent visual acuity at distance in each eye with:

R.—4.50 Sph.⊃—1.25 Cyl. axis 90.
L.—4.50 Sph. ⊃—0.50 Cyl. axis 90.

and gratifying results at near with +3.00 addition. These results were obtained only with certain well defined limits of illumination and our problem was to control the amount of light that entered those eyes. The eyeshade had its limitations because it failed to exclude light from each side and from below. Tinted lenses kept the pupil open but further dimmed already dimmed vision.

"We met the conditions in the following manner: In a 38 millimeter round lens, distance correction, we left white a section 15 millimeters wide by 24 millimeters high and neutralited the remainder of the lens to as deep an amber as procurable by this method. The size of the uncolored area is such as to permit the eye to see straight ahead and through a fairly wide angle to right and left and, a very important point, all the way down to the bottom of the lens so as to assure clear vision in walking and especially in stepping up or down. The only difference we made in the reading lenses was in the height of the uncolored section which was made 22 millimeters high instead of 24 millimeters, for obvious reasons. The lenses were ground in toric form on a 6 base, in order to get a deep cut effect so as to hug the eyes closely and exclude as much light as possible from all directions. Bright light from below, such as from sand or water, caused trouble but this was an infrequent annoyance. A dark rimmed zylonite frame was used which intercepted some light from many angles.

"The first visit occurred October, 1923. The second October, 1924, when we changed the prescription to:

R.—5.00 Sph.⊃—1.25 Cyl. axis 90.
L.—5.00 Sph.⊃—0.50 Cyl. axis 90.

with a +4.00 addition for reading at 10 inches. Conditions were otherwise unchanged.

"October, 1926, we found a more marked change and prescribed:

R.—6.00 Sph.
L.—6.00 Sph.

with a +4.00 addition for reading. This gave 25 per cent visual acuity at distance."

While the theory of these treatment lenses closely parallels that suggested by Scherer and later modified by the writer, the mechanical application varies materially in two essentials. In the lenses used by both Scherer and the writer the greater portion of the inner surface of the lens was covered with black enamel and the lenses were further supplied the patient in a spectacle frame which had fiber side shields. In Ryer's and Hotaling's case just quoted the lenses were subjected to a neutraliting process, thus eliminating the disadvantage of the enamel chipping off and in their case no side shields were used.

This neutraliting process consists in placing the lens under electrical treatment until it turns the yellow or amber tint desired. In making the distance and reading lenses for the patient just quoted a piece of lead, the size of the clear area was placed over that portion of each lens which was to remain clear, the other portions of each lens being treated in such a manner as to make them as dark an amber as possible. This darker peripheral portion of the tinted lens absorbs a sufficient amount of light to ensure large pupils, thus enabling the patient suffering from nuclear cataract to use the clear areas around the lenticular opacity for the passage of light. According to Ryer, Mr. Louis Michaels, optician at 11 West 46th St., New York City owned, at the time these lenses were made, the only neutraliting apparatus known to him. C. C. K.

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BOOK NOTICES

ACTINOTHERAPY AND ALLIED PHYSICAL THERAPY. T. Howard Plank, M. D. Published by the Mantz Corporation, Chicago. 459 pages—60 full page plates. 1926.

Dr. T. Howard Plank, by publishing his book on "Actinotherapy and Allied Physical Therapy" rendered a distinct service to the practitioners, who are interested in the study and practice of this special branch of science. He left out all of the theroretical considerations and from the very beginning plunges right into the subject and tries to explain in simple language the underlying principles and applications of this new and fascinating subject.

In the first fourteen chapters which make up the first quarter of the book, Dr. Plank goes into great detail describing the different spectrum regions and the therapeutic value of each region. He also describes various types of apparatus which are capable of producing certain kinds of rays. The wave lengths, visible light, ultra-violet and infra-red rays, their physics and therapeutic values are each discussed in a separate chapter. The different types of high frequency, diathermy, sinusoidal and galvanic currents are also described in an able and understandable manner.

Discussing the therapeutic value of actinic rays, Dr. Plank claims that they are antiginic, they are bactericidal, they increase oxidation, they increase the erythrocytes and normalize the leucocyte count. They destroy bacteria and they both sooth and vitalize in neurasthenic conditions.

The remainder of the book is devoted to the description of the application of the different types of technics to the varying abnormal conditions. There are 60 full page plates, showing many cases as they were before the treatment and how they appear after treatment. This book serves as practical guide to the practitioners of this specialty.

J. I. K.

EPITOME ON BLOOD PRESSURE. Burton Baker Grover. Published by the Electron Press, 115 E. 31st St., Kansas City, Missouri. 78 pages. 1924. Price $3.00.

In this Epitome on Blood Pressure, Dr. Grover tries at some length to unravel the mysterious causes which are responsible for abnormal blood pressure, both in case of hypotension and hyper-

tension. Part of the book is devoted to describing the proper technique for taking blood pressure.

In discussing the methods of the reduction of high arterial tension, Dr. Grover claims that the use of drugs to reduce high arterial tension is undesirable and often dangerous. The tension he claims can be reduced with safety by the use of auto-condensation and he further states that in over ten thousand treatments of hyperpiesia and hypertension by auto-condensation he has not observed one single injurious effect. Auto-condensation claims Grover lowers blood pressure thus relieving the labor of the heart and other symptoms of impaired circulation. He admits that this method will not always yield favorable results in hypertension, however, when employed in the proper manner it is one of the most potent agencies for good in the management of cardic vascular disfunction.

J. I. K.

ABSTRACTS

VOLUNTARY PROPULSION OF BOTH EYEBALLS. H. Ferrer. The American Journal of Ophthalmology. Vol. 11, No. 11, pp. 883-885. Illustrated. 1928.

Ferrer, of Havana, Cuba, reports the case of a patient who was able to dislocate his eyeballs forward from their normal position. This patient, according to Ferrer, has a visual acuity without correction for the right eye of 20/40 and for the left eye of 20/30. The visual field is normal and free from scotoma. The extrinsic muscles have normal function, but there is alternating divergent strabismus of twenty degrees, the left eye fixing by preference. The accommodation is normal, the media clear, the fundi normal, color sense and tension normal.

The propulsion, says Ferrer, is executed with astonishing facility, the eyes being opened steadily and pushed straight forward for nine millimeters. This position is maintained for several minutes without any indication of discomfort and without any reduction of visual acuity, although the power of rotation is quite limited. The eyeballs are then returned to their normal position without difficulty. The propulsion and retraction are effected with both eyes simultaneously or either eye separately, but in the latter instance the eye which is not propelled is closed slightly.

To explain this phenomenon, says Ferrer, it is necessary to discuss some details of the anatomy and physiology of the eyes. The human eye is placed almost in the center of the orbit, and is easily capable of rotary movements about the vertical and transverse axes, but in spite of its extreme mobility it cannot move forward or backward, being held in a definite anteroposterior position by means of the panniculus adiposus which serves as a cushion, by the extrinsic

muscles, by the capsule of Tenon with its orbital and muscular prolongations, and by the eyelids. This anteroposterior fixation is necessary to avoid stretching of the optic nerve, which is, however, sufficiently lax to allow of rotation of the eyeball within the orbit.

The mechanism by which Avelino Perez produces this phenomenon is, according to Ferrer, easily recognizable. It depends upon his ability to contract the two oblique muscles, the propulsors of the eyeball, at the same time relaxing the four recti which serve as retractors, and opening the eyelids widely. Abandoned to the control of the oblique muscles, the eyeball passes through the palpebral fissure, smoothly and without violence, more or less rapidly according to the patient's wishes. When more than half the eye has been dislocated from the orbit, the patient contracts the orbicularis muscle behind the equator of the eyeball and holds the ball in position as long as he desires. To return the eye into the orbit, he relaxes first the orbicularis and then the obliques.

T. O. B.

IN DEFENSE OF THE TONSIL. J. T. Scott. The Eye, Ear, Nose and Throat Monthly. Vol. 7, No. 10, pp. 504-507. 1928.

Scott claims that inasmuch as the tonsil is generally considered to be an organ of no important necessary function, the tendency has been to condemn it many times on the theory that its removal will do no harm even if it accomplishes no good. His position is that the tonsil is endowed with an important function which is not only physiological but mechanical as well. In order to defend this position it becomes necessary for him to review carefully the histology, construction and physiological function of the organ. As to the anatomical construction he quotes from Stohr, a recognized authority, who says:

"The upper or respiratory part of the pharynx is clothed with stratified ciliated columnar epithelium. Very richly developed is the adenoid tissue. Between the pillars of the fauces it forms conspicuous accumulations, one on either side, known as the palatine tonsils, which in respect to their structure in man and many animals correspond to an aggregation of large lymph nodules like those at the root of the tongue. The leucocytes that wander through the epithelium of the tonsils are so numerous that the latter may be regarded as the most fertile source of the salivary corpuscles. Many mucous glands lie in the neighborhood of the tonsils. The adenoid tissue is also vigorously developed in the respiratory portion of the pharynx where, on the posterior wall between the orifices of the Eustachian tubes, it forms a conspicuous mass, the pharyngeal tonsil, which agrees in structure with the palatine tonsil excepting that the lymphoid tissue is less sharply circumscribed. Here, too, many leucocytes migrate through the epithelium. The mucous membrane of the root of the

tongue extending from the circumballate papillae to the epiglottis is peculiarly modified by the development of lymph nodules. They are spherical aggregations of adenoid tissue from 1 to 4 m/m in size that, embedded in the uppermost strata of the tunica propria, form easily perceptible microscopic elevations. In the middle a punctate opening may be seen, the entrance to a deep central crypt, lined by a continuation of the stratified epithelium of the oral mucous membrane. Encircling this epithelium is a zone of diffuse adenoid tissue which contains a variable number of lymph nodules with germinal centers and is sharply separated from the fibrillar connective tissue of the tunica propria; when the follicles are well developed, the fibrous bundles of the tunica propria are circularly disposed about the adenoid tissue and so form a fibrous capsule. Under normal conditions numerous leucocytes of the adenoid tissue continually wander through the epithelium into the central crypt and from there to the oral cavity: they are readily found in the saliva as mucous and salivary corpuscles. The epithelium is often greatly expanded in consequence and destroyed, or is infiltrated with leucocytes to such a degree that its boundary can not be definitely determined. These glands are histologically counterparts of the tonsils."

Scott also quotes Klein who says: "The tonsils are masses of lymph follicles and diffuse adenoid tissue covered with a thin mucous membrane which penetrates in the shape of longer or shorter folds into the substance within. Numbers of mucous secreting glands situated outside the layer of lymph follicles discharge their secretion into the pits between the folds. The free surface of the tonsils and the crypts is covered or lined with the stratified epithelium that lines the oral cavity. Numbers of lymph corpuscles constantly, in the perfectly normal condition, migrate through the epithelium on to the free surface and are there mixed with the secretions of the oral cavity. The so-called mucous or salivary corpuscles of the saliva, taken from the oral cavity, are such discharged lymph corpuscles. They become swollen up by the water of the saliva and finally disintegrate.

"The pharynx tonsil occurring in the upper part of the pharynx is in all essential respects the same as the palatine tonsil. The lenticular glands of the stomach, solitary glands of the small and large intestines and agminated glands of the ileum are groups of lymph follicles. In most instances the capillary blood vessels form in the lymph follicle meshes, arranged in a more or less radiating manner from the periphery towards the center; around the periphery there is a network of small veins. A larger or smaller portion of the circumference of the follicles of the tonsils, pharynx, intestines, bronchi, etc., is surrounded by a lymph sinus leading into a lymphatic vessel. The lymphatic vessels and lymph sinuses in the neighborhood of lymphatic follicles or of diffuse adenoid tissue are almost always found to contain numerous lymph corpuscles, thus indicating

that these are produced by the adenoid tissue and absorbed by the lymphatics."

As to the mechanical function, Scott quotes from Kirke's handbook of physiology as follows: "A tonsil consists of an elevation of the mucous membrane representing twelve to fifteen orifices which lead into crypts or recesses in the walls of which are placed nodules of adenoid tissue. These nodules are enveloped in a less dense adenoid tissue which reaches the mucous surface. The surface is covered with stratified squamous eoutgekuynm and the subepithelial or mucous membrane proper may present rudimentary papillae formed of adenoid tissue. The tonsil is bounded by fibrous capsule. Into the crypts open the ducts of numerous mucous glands. The viscid secretion which exudes from the tonsils serves to lubricate the bolus of food as it passes them in the second part of the act of deglutition."

As to the physiological function, Scott quotes from Flint's Physiology as follows: "It may be stated that the fluids of the mouth and pharynx have quite as important an office in preparing the food for deglutition and for the action of the juices in the stomach as in the digestion of starch. It is a matter of common experience that the rapid deglutition of very dry particles is impossible. In the human subject the quantity of saliva absorbed by the various articles of food is very large, the average being between forty-five and fifty ounces. It seems impossible that the fluid thus incorporated with the food should not have an important influence on the changes which take place in the stomach, especially as regards the digestion of starch. It has been shown that all the varieties of human saliva have the same effect on starch as the mixed fluids of the mouth. The organic constituent of most importance is ptyaline. This substance has been studied by Mialhe and is described under the name of animal diastase. He regards it as the active principle of the saliva and when brought in contact with hydrated starch, readily transforms it, first into dextrine and afterward into glucose. He says that the energy of this action is such that one part is sufficient to effect the transformation of more than two thousand parts of starch. Very little need be said concerning the other inorganic constituents except that they are of such a nature as almost invariably to render the fluid distinctly alkaline."

The foregoing statements are, according to Scott, convincing evidence that the tonsils are glands of importance endowed with a double function, that of external as well as internal secretion. They function continuously and are headquarters for the production of lymphocytes which produce ptyaline, which are carried in the act of deglutition into the stomach and alimentary canal where they are absorbed and carried by way of the lymphatics into the general circulation.

The paper closes with a plea for treating rather than removing the tonsils. C. C. K.

VI-DEX OPTOMETRIC RECORD SHEETS. W. F. Kimball. The Optometric Weekly. Vol. XIX, No. 41, p. 1472. 1928.

Kimball presents a new loose-leaf record sheet which are visibly mounted, twenty-seven to the page in binders made to hold them in alphabetical order. T. O. B.

COLOR BLINDNESS. J. Mansell. The Optician (British). Vol. LXXV, No. 1942, pp. 315-316, 1928.

Mansell claims that Dalton, the distinguished English Chemist of the 18th Century, seems to have been the first to have studied the condition. He suffered from color-blindness himself, and the particular type exhibited by him, viz., red blindness, was, for a long time, described as "Daltonism." The Swedish physiologist, Holmgren, later gave the subject much attention, particularly in its relations to possible accident by rail or at sea, through faulty recognition of colored signals. It was he who first suggested tests for color blindness in the case of those who were responsible for the interpretation of signals employed on railways or upon vessels.

A number of theories have been put forward to explain the facts of color vision, but none of them has been completely successful, inasmuch that the explanations made have not been adequately confirmed by experimental verification. Three theories are well-known to readers, viz.: the Young-Helmholtz proposed by Thomas Young in 1807, and afterwards modified and expanded by Helmholtz; Hering's theory, and the Franklin or Molecular Dissociation theory proposed by Mrs. Franklin in the 'Zeitschrift f. Psychologie und Phys. d. Sinnesorgane' in 1892. All these theories regard color blindness, whether total or partial, as an affection or lack of normal development of the cones, resulting in a faulty decomposition of the three photochemical substances present in the retina. Numerous statistics have been collected from time to time to show that the defect is fairly prevalent, particularly among men. It has been authoritatively stated that color blindness among men averages from 2 to 5 per cent, whilst among women the proportion is much less, barely reaching 1 per cent. The poorly educated classes are said to be more prone to the condition than the well educated, and the condition is usually congenital. Color blindness exists in different degrees of completeness, that is, varying from a total loss to a simple imperfection or feebleness of the color sense. Those who are completely color-blind as regards some or all of the fundamental colors fall into two groups (a) the dichromatic, whose color vision may be represented by two fundamental colors, and their combinations with white or black, and (b) achromatic, or totally color-blind, who see only the white-grey-black series.

In considering dichromatic vision, Mansell finds that those who

fall into this class fall into three distinct groups, viz., the red-blind, the green-blind and the violet-blind. The most common by far of these groups is that of so-called red-blindness, but as a matter of fact, subjects so affected are in reality red-green blind. In typical cases such persons distinguish in the spectrum only yellows and blues; the red, orange, yellow and green appear as yellow of different shades, the green-blue as grey, and the blue-violet and purple as blue. The red extremity of the spectrum is definitely shortened, particularly if the illumination is poor, and the maximum brightness, instead of being in the yellow, as in normal eyes, is in the green. When red-green blind subjects examine the spectrum they see either a neutral grey band at the junction of the blue and green, or simply the yellow passing with extremely little change, directly into the blue. As a matter of fact, in red-blindness, the most characteristic defect is the failure to see or appreciate green, the color being confused with grays and dull shades of red. Violet blindness seems to be so rare that no very exact study of the condition has been made. According to Collins and Nagel, 'Zeitschrift f. Psychol. u. Physiol. d. Sinnesorgane, 1906,' the violet band end of the spectrum is colorless, and a neutral band appears also in the yellow-green region.

Although the vision of the red and green blind, claims Mansell, is lacking as regards green and red colors, they will often recognize these colors and name them correctly, so that in order to test the deficiency they must be examined by some test which compels them to match certain colors. Under these circumstances it will be found that they will make correct matches together with others which to the normal eye are erroneous. There are a large number of methods which are used to detect color blindness, but the simplest is that of Holmgren first described by Liven and Wendt in the 'Skandinavisches Archiv. f. Physiologie' in 1905. A number of skeins of wool are used and three test colors are chosen, viz., (a) a pale pure green skein, not inclining towards yellow-green, (b) a medium purple (magenta color) skein, and (c) a vivid red skein. The subject is given skein "a" and is requested to choose from the pile of assorted colored skeins those which have a similar color value, that is, not to make an exact match, but to select those which appear to have the same color.

T. O. B.

A CASE OF SIMULATED VISION. F. McFadden. The Commonwealth Optometrist (Australian). Vol. X, No. 8, pp. 280-282. 1928.

McFadden presents a case of a patient, male, age 66, who had gotten hurriendly out of bed one night, sensing that something had suddenly gone wrong, but he did not know what. He switched on the light and found that he was blind, but a few moments later discovered that the inability to see was confined to his right eye. The

physician whom he soon consulted found that there was a lesion in the optic nerve or tract, but also found upon urinalysis that he was discharging a large sugar content (diabetes militus), and at once put him upon the regime usual to such cases.

This occurred some two or three years ago, and he has considered himself practically monocular since that time. He recently consulted McFadden for glasses and in the course of his investigation he learned that macular vision was a total loss, but that field vision held some interesting factors in store. The patient was totally unable to see a letter or character by direct observation, but with the large E thrown on the chart from the Clayson instrument McFadden was enabled to give the character a motion in various directions, and the moment motion took place the eye perceived the object, and when large enough to cover a reasonably large retinal area the character of the object was readily perceived.

Further observation of this peculiarity of vision, conducted at a proximal range, disclosed even more interesting conditions. With the head removed from the ophthalmoscope and the small lamp held directly before the eye—the mate being closely covered—even this bright object was wholly unperceived so long as it was still, but the eye at once perceived the object the instant it moved. At the instant motion ceased, there was no further perception until movement again took place. This tiny light, held at a distance of several inches, or several feet from the eye, and vibrated in the horizontal, vertical, or any intermediate meridians, rotated circularly, or figure-eight, was instantly and continuously visible, fully as visible to the field of the defective eye as it is to the other and uninjured mate.

Motion-toward the eye of the object, or motion-from, was likewise readily perceived and direction of motion correct, the patient telling accurately the direction of motion and approximate distance as well as with the good eye. But let motion cease in any position, and perception vanished instantly.

The experiment with the tiny lamp was repeated with objects of various characters to learn whether or not the factor of intense light was wholly necessary and McFadden was not a little surprised to note that almost any object was within the grasp of practicable vision so long as the object moved. Now, this man, says McFadden, has driven a car for many years, and states that he has no difficulty in seeing objects with this eye while he and the car are in motion, that the fact of movement whether of himself in the car approaching and passing an object gives him the full sensation of vision, just as it always has done previous to his collapse.

Moreover, in walking on the street and in his store, he has no sense of the loss of vision while meeting people, passing them by, or in the perception of objects which one would suppose he might bump into—so long as he keeps moving, or so long as objects move.

The moment he stops, however, vision of that eye stops, and he is totally monocular.

T. O. B.

HEADACHES. J. Mansell. The Optician. (British) Vol. LXXVI, No. 1962, pp. 188-189. 1928.

Mansell claims that the most common type of headache is the migraine headache with vomiting accompanied perhaps by some visual symptoms, but he says, the more important diagnostic points to remember are the periodic nature of the attacks, their tendency to occur in women particularly at menstrual periods, and the fact that the patient complains that she has suffered from them since childhood.

Another most important cause of headache is, he claims, the eyes. Eye-strain is often the cause, but its importance is frequently exaggerated. The headache complaint is in either the frontal or temporal regions, and is bilateral. Such a headache is associated with hyperopia or hyperopic astigmatism, but it may occur even if the refraction is perfectly normal in neurotic subjects. A vertical headache is rarely due to an error of refraction alone. One can distinguish this type of headache from the migranious, inasmuch as it only becomes manifest after the eyes have been used for some time, and also that it is very seldom present, or at all severe, in the mornings. A neurasthenic headache is easily recognized by the fact that the patient usually describes it as a feeling of weight on, or constriction of the head, or sometimes as a sense of "emptiness" within the skull. Like other symptoms of neurasthenia, it is worse in the morning, and is increased by worry or excitement.

Alcohol, nicotine, and toxins in the body also cause headaches which are usually vertical, or diffuse, and consist of either a persistent dull ache, as in chronic poisoning, or an intense pain, as in acute infections.

If the headache complained of is severe, deeply-seated behind the eyes or in the temples, periodic and lasting for a few hours to a few days, or even constant, becoming most severe at night, and sometimes accompanied by vomiting, it is due to raised intracranial pressure, claims Mansell. Should the patient therefore complain of headache, a knowledge of the following points is essential: First, its position, whether general or circumscribed, superficial or deep in the head, and the position of greatest intensity. Second, the time of the day when it becomes worse, whether it is constant or varies, and if it recurs at regular periods. Third, the nature of the pain, that is, whether it is a dull ache, or throbbing pain, or intermittent shooting pain, or a feeling of bursting in the head. Fourth, ascertain what starts the headache; whether it is due to work. Last, whether ocular symptoms or vertigo are present, and whether parents or

collaterals are also subject to headaches, and if so, are they of the same type. T. O. B.

FUNCTIONAL DIPLOPIA IN A SCHOOLBOY. A. M. MacGillivray. The British Journal of Ophthalmology. Vol. XII, No. 11, pp. 588-589. 1928.

MacGillivray gives an interesting and unusual case of duplication of letters, words and figures in a schoolboy, without any discoverable organic cause. As far as could be ascertained, no similar case was ever, he claims, reported, and no mention of the condition could be found in the text books of ophthalmology. The case was as follows:

John D, aged 8 years, a healthy, highly intelligent boy, was brought by his mother for consultation on account of periodic attacks of double vision of some six months' duration. Lately the attacks had recurred with greater frequency, the double vision becoming more pronounced and inconvenient. On investigation it was discovered that the double vision was of a very unusual character. When asked to read the letters and figures of Snellen's test types with the right eye alone, the patient proceeded to do so rapidly and without stumbling, but each letter was read twice, viz.: T, T; N, N; E, E, etc., the vision being 6/6. Precisely the same occurred when the right eye was covered up and the left used alone, the patient again reading, T, T; N, N; E, E, etc., to 6/12. With both eyes open the letters and figures were again read duplicated, as had occurred when they were read with each eye separately, viz.: T, T; N, N; E, E, etc.

Reading from a book, the patient saw two words instead of one, each word standing clearly alongside the other, without overlapping. Until a short time before he had been able to read fluently and correctly by ignoring one of the images, but the double vision had become so marked that he was experiencing great difficulty in continuing to do this. His teacher reported that on a recent occasion when told to copy the figure 6 from the blackboard he had put two sixes on his slate instead of one. This appears to have been the only occasion when the double vision had made itself manifest to his teacher.

There was no suggestion of word or figure blindness and he was able to write easily to dictation. Any element of malingering was eliminated as far as possible by prolonged and searching tests.

The refraction was practically normal, there being only a low degree of hypermetropic astigmatism, equal in amount in each eye. Nothing abnormal, such as corneal nebulae, could be seen externally and the fundi were normal in all respects. The lenses were in their usual position, there being no trace of subluxation. The extrinsic muscles of each eye were in a state of orthophoria. The only abnormality that could be found was a definite red-green color blindness.

No treatment was prescribed, but the child was assured that the

trouble would completely disappear in a short time. The mother was warned on no account to discuss the double vision in any way with the patient, or in his presence. Six weeks later the child was again examined, when it was found that all trace of the double vision had disappeared. A year later he was re-examined. No recurrence of the trouble was reported. The vision of each eye was then 6/5.

In the absence of any discoverable organic cause, MacGillivray was led to the conclusion that the condition was of a purely functional nature. It is impossible to say what the factor was that suggested the symptom to the child. As far as could be ascertained, no mention of double vision had ever been made in the boy's presence, nor had he ever had any opportunity of reading about it. T. O. B.

THE THERAPEUTIC VALUE OF THE BASE-IN PRISM. E. L. Ryer and E. E. Hotaling. The Columbia Optometrist. Vol. 2, No. 4, p. 4, 1928.

In this general paper on optometric procedure, under the heading of "The Wedge," Ryer and Hotaling claim, regarding the base-in prism, first, that case after case of latent hypermetropia that will not yield to cycloplegia or to plus lens correction, may be unlocked by driving, figuratively, that base-in prism wedge between the plus lens and the convergence-accommodation, thereby complementing the relaxing or inhibitory influence of the plus lens on the accommodative portion, with the relaxing or inhibitory influence of the plus prism on the convergence portion of the convergence-accommodative act. Second, that case after case of what was formerly deemed progressive myopia is now successfully checked or reduced or eliminated by the inhibitory action of the base-in prism. Third, that in astigmia, actually the corneal curvature, is modifized by base-in prism action. Fourth, that anisometropia and antimetropia are modified, advantageously, by base-in prism action, and fifth, that neurosis will yield to base-in prism action and point the way to optometry extending her field far into psychology and away from pathology and surgery.

C. C. K.

THE NEAR POINT CROSS CYLINDER TEST IN A ROUTINE OPTOMETRIC EXAMINATION. E. Bind. The Optical Journal and Review. Vol. LXII, No. 21, p. 20. 1928.

Bind is of the impression that the near-point cross cylinder test is worthless, in the large majority of cases. He claims that the chromatism created by the displacing prisms is likely to be a real source of error, pointing out that it is very difficult for a patient to tell which of two lines is clearer when he sees one set red and the other blue. The test is, he claims entirely subjective and the findings are not reliable either for the amount of plus to be prescribed or the amount of prism if any to be added. T. O. B.

ANNOTATIONS AND SOCIETY PROCEEDINGS

The American Journal of Optometry is the official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Iowa, Maine, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont and West Virginia Optometric Associations.

The following gentlemen have consented to supply items of interest from their respective sections, acting in the capacity of

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PERIMETRY AND COLOR FIELD ANALYSIS

Can the progressive optometrist of today be successful without the use of Perimetry? I for one, writes Dr. A. R. Reinke of Oakland, California, being actively engaged in the practice of optometry and using Perimetry, feel that it is a diagnostic test that should not be neglected. Every patient, I believe, should be given the advantage of a color field analysis no matter how insignificant the complaint brought into the office might be. Of course, there are those who will say, "I have made a success of my practice without Perimetry." But have you? What did you do with those patients who came back complaining and found again and again the same lenses were sufficient, but still no relief was given? And surely this has happened. Did it ever occur that it might be some remote condition causing the discomfort and that a simple Perimeter can detect most of the trouble.

After trying various lenses and giving no relief why should you be forced to give up and send the patient around the circuit of various practitioners? The optometrist of the future will be the analyzer of human ills, when he learns to use the instruments that are rightly within his power to use. The Perimeter is one of the foremost instruments for an analysis of human ills through the eye. Every optometrist or his nurse can learn to take color fields accurately with a little practice. It may seem new, just as the retinoscope seemed peculiar the first time. The more difficult part of course, is analyzing the color field chart after it has been taken. This requires concentrated effort and study, but confidence will come after the first few cases are

analyzed. When you can sit down with the patient and discuss the color field charts along with the other findings of the dark room, it takes you out of the mediocre class of Optometrists to a higher plane where the profession rightly belongs. Some one hundred and six Optometrists and three Ophthalmologists in San Francisco, Oakland and other bay region cities are of the same opinion, I am sure.

This group has just finished a course in Perimetry and color field analysis under the direction of Dr. T. A. Brombach, one of the most able and learned men in the practical application of Perimetry. After more than seventeen years of practical experience in Optometry and Perimetry Dr. Brombach was persuaded to formulate a course of fifteen lectures which were given under the University of California Extension Division.

Following is an outline of the course just completed:

Lecture 1. Differentiation between Direct and Indirect Vision and a short review of the Physiological and Psychological Part of Binocular Vision. Lecture 2. The technique of measuring the form and color field. Lecture 3. Arc Perimetry. Lecture 4. Scotomata. Lecture 5. Perimetry in Strabismus. Lecture 6. Intoxication. (Exogenous Toxemia). a. Temporary intoxication, stimulative type. Lecture 7. Intoxication (continued). b. Temporary intoxication, depressive type. Lecture 8. Intoxication (continued). c. Temporary Intoxication, amblyopic type. Lecture 9. Intoxications (continued). General conclusions of Diagnostic Value. Lecture 10. Auto Intoxication. (Endogenous Toxemia). a. Primary type. b. Secondary type. Lecture 11. Auto Intoxication (continued). Focal Infection Type. Dental Focal Infection. This lecture delivered by F. Vance Simonton D. D. S. Lecture 12. Differential Analysis of Intoxication and Auto Intoxication. Lecture 13. Ametropia and Heterophoria. Lecture 14. Hygiene, Optometric. Lecture 15. a. Sectorial Defects. b. Hemianopsia. c. Relative Hemianopsia.

During the course, which lasted over a period of fifteen weeks, the following color field analyses were made by members of the class. The case records were completed with the co-operation of physicians and dentists in private practice and complete records were submitted to Dr. T. A. Brombach for verification.

1. Kaffee Hag. 7. Caffein intoxication, stimulative type. 3. Caffein intoxication, depressive type. 19. Tobacco intoxication, stimulative type, 2. Tobacco intoxication, depressive type. 5. Alveolar abscesses. 3. Pyorrhea. 1. Quinine intoxication. 1. Bitemporal hemianopsia, glioma of hypophysis. 1. Bitemporal hemianopsia, adenoma of pituitary body. 1. Quadrant anopsia, pathology of sphenoid sinus. 1. Right homonymous hemianopsia, under observation by neurologist. 5. Intestinal intoxication.

It might be of interest to state that one of the members of the class constructed a newer type of Perimeter, which is receiving favorable comment throughout the state of California.

Even though the course is over, the members of the class have banded themselves into an Optometrical Color Field Analysis Research Society.

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NEW ENGLAND REGIONAL MEETING

Dr. C. R. Padelford, president of the New England Council of Optometrists, announces the dates for the coming regional meeting of this group. The meeting will be held in Boston, Mass., March 13th, 14th and 15. The meeting will close with a presentation of medals and fellowships by the Distinguished Service Foundation of Optometry. Dr. Stratton of the Massachusetts Institute of Technology will make the presentations.

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FUNDS FOR CLASS A OPTOMETRY SCHOOLS

Dr. E. H. Kiekenapp, secretary of the Minnesota State Board of Optometry writes that the following resolution was introduced and passed at the meeting of the Minnesota State Board of Optometry, December 28th, 1928. It was deemed advisable that this fund be built up to benefit all Grade A Schools, thus avoiding any discrimination.

Resolution

BE IT RESOLVED, That, beginning with the year 1929, each board member of the Minnesota State Board of Optometry contribute one day per diem each year to the International Association of Boards of Examiners in Optometry, with the request that same be distributed equally by the International Association of Boards of Examiners in Optometry to Grade A Schools teaching Optometry and known to be in need of such appropriation to more successfully carry on their work.

RESOLVED, That the Minnesota State Board appeal to all other State Boards of Examiners in Optometry to follow the same course, thereby building up an annual appropriation for worthy schools in need of assistance.

RESOLVED, That this donation be considered a personal and voluntary donation on behalf and in the interest of better Optometry and Optometry schools.

RESOLVED, That a copy of this resolution be forwarded to the secretary of each Optometry Board with the request that it be read at their next Board meeting.

RESOLVED, That a copy of this resolution be sent to the Optometric magazines for publications.

Dr. Kiekenapp continues, saying that: We realize that in some states the per diem for each Board member is more than in others; likewise, we realize that some State Boards are composed of but three members; however, to get the proper perspective of the benefits possible under this plan, let us assume that each state has a Board

of five members and that the per diem of each member is $10.00. This means $50.00 a year from each Board, and $50.00 a year from forty-eight Boards equals $2,400.00. If this amount could be forthcoming from the various State Boards and, by the International Association of Boards of Examiners in Optometry, distributed annually to Grade A schools, an appropriation of between five and seven hundred dollars would be forthcoming to each of these schools to encourage them on their way.

The plan will only work effectively if every Board will join in this movement. So, it is in the interest of progressive and professional Optometry, bettering and constantly improving Optometry schools that we appeal to all State Boards to join in this movement.

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MICHIGAN MID-WINTER MEETING

The mid-winter meeting of the Michigan Association of Optometrists will, according to Dr. G. O. Ohlsson of Detroit, be held at Jackson, Michigan, February 19th, 20th and 21st. The meetings will be almost entirely educational, the following practitioners taking part in the program. Dr. Frank Festor of Detroit has arranged for a demonstration of the making of artificial eyes. Two experts in this art will be present to explain as the demonstration proceeds. Next on this program will be the opening lecture of a new series by Dr. Carl Shepard of Chicago. Dr. Shepard is always practical and able to present modern optometry in such a fashion as to aid us in our work. Wednesday morning Dr. Shepard will continue his presentation of optometry from the angle of treatment and prevention. Wednesday afternoon Dr. Festor will conduct his "Round Table Discussion and Question Box"—a feature which proved so successful at the Kalamazoo meeting. It is suggested that questions be mailed early to Dr. Frank Festor, Temple Theater Building, Detroit, Mich. At the Kalamazoo meeting, this feature held the attention for five hours, none leaving during the entire period. Real knowledge, derived from the practical experience of our colleagues, such is the object. An added feature Wednesday afternoon is under the direction of Dr. Jay Gould of Battle Creek, who will conduct special groups in modern instrumentation. The aim here is to aid in achieving what we hope for in Michigan, "Uniform Optometric Procedure"—a worthwhile aspiration. We all know Dr. Gould and his ability, a sufficient recommendation of the value of this mid-winter feature.

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NEBRASKA STATE CONVENTION

Dr. F. Gonder, secretary of the Nebraska State Association of Optometrists reports that the Annual Convention of that society was held at the Corn Huskers Hotel at Lincoln, January 28th and 29th. The educational features of the program were as follows: Dr. C. F. Shepard on Ocular Diagnosis;

Dr. J. C. Copeland on Retinoscopy, and Dr. Roy S. Dean on the Stereoscopic Development of the Fusion Faculty.

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MAINE ANNUAL MEETING

The Annual meeting of the Maine Association of Optometrists was, according to Dr. P. M. Deane of Lincoln, held at the Eastland Hotel, in Portland, on January 9th and 10th. The principal educational features were talks by the following men: Dr. J. Neumeuller spoke on Professional Optometry and on Fusion Training; Dr. C. R. Padelford spoke on The Optometric Educational Work which is being carried on in Massachusetts and also on An Ocular Examination; Dr. W. I. Brown spoke on Biomicroscopy of the Living Eye and also on Ophthalmoscopy; Mr. Scott Sterling spoke on Near Point Effect of Distance Corrections.

Dr. George S. Houghton, President of the A. O. A., attended the convention where he outlined the activities of that body.

Dr. Walter P. Connley was elected President for 1929, Dr. Paul J. Carey, 1st Vice-President; Dr. Philip, 2nd Vice-President; and Dr. Arthur L. Corriveau was elected Secretary and Treasurer. The Executive Committee is composed of the above named officers and the following gentlemen: Dr. D. E. Plaisted, Dr. W. F. Leavitt, Dr. H. L. Bryant, Dr. G. A. Rand and Dr. E. L. Greenleaf.

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GRADUATE COURSE AT OHIO STATE UNIVERSITY

The annual graduate course given by the department of Applied Optics at Ohio State University will be held the week starting February 18, Morgan C. Davies, M. D., head of the department, announces.

The program includes such well known lecturers as Charles Sheard, Ph. D., former director of the School of Applied Optics at Ohio State University and now connected with the Mayo Clinic at Rochester, Minn.; Ralph Barstow, of the University of Rochester; Max Poser and Scott Sterling, of the Bausch & Lomb Optical Co.; Julius Neumeuller, of the faculty of the Pennsylvania State College of Optometry; Richard Hall, of Cleveland, a graduate of the Ohio State school; E. D. Helfrich, M. D., specialist in eye, ear, nose and throat, and E. A. Calvert, M. D., both of Columbus, and the staff at the school, including Morgan C. Davies, M. D., C. E. Ellis and Orville Kraner.

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MINNESOTA ANNUAL CONVENTION

The annual convention of the Minnesota State Association of Optometrists will be held at the Nicollet Hotel, Minneapolis, Minnesota, February 10th and 11th. Dr. A. M. Skeffington and Dr. J. C. Copeland will speak. Following the convention Dr. A. M. Skeffington will hold a four day series of Clinics on Graduate Work in Optometry.

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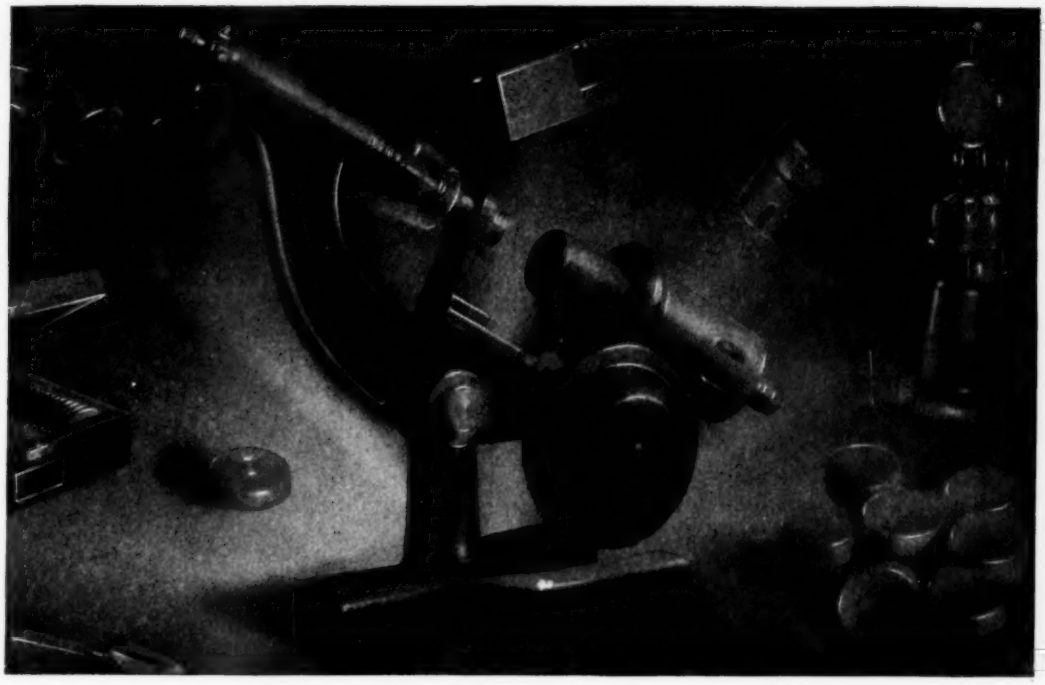

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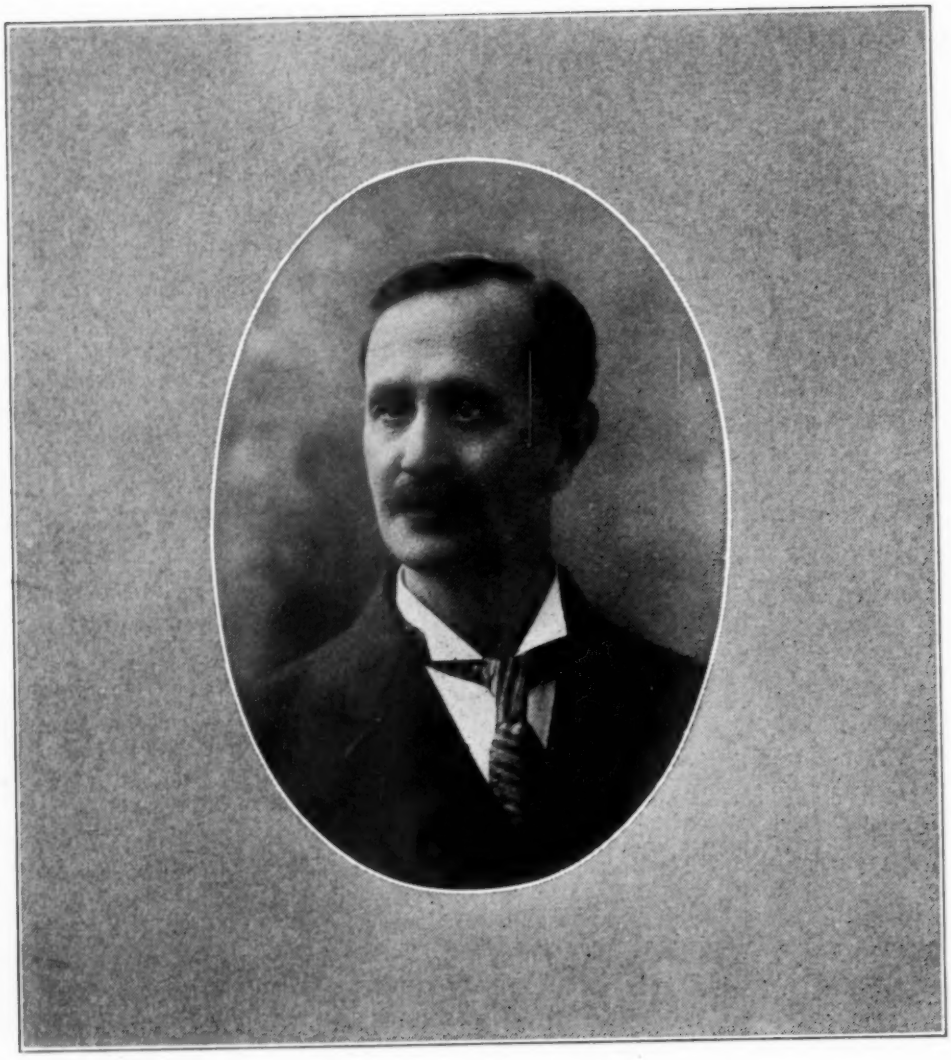

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